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green from the ground up

AK/HA Manufacturing LLC.

Operation & Maintenance Manual

Class 1 NSF/ANSI Standard 40 AP Series Wastewater Treatment Plant

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Introduction

The AP Series Aerobic Treatment Units (ATUs) are now available through **Hydro-*Action*®**. Please read this introduction before reviewing this manual.

Earth's environment has purified water through natural processes since the beginning of time. Only recently, beginning in the Twentieth Century, has man developed a system to accelerate the processes that Mother Nature uses. **Hydro-*Action*®** AP Series ATUs are just such systems.

In 1916, the City of Houston, Texas, was the first to use the activated sludge wastewater treatment process as an accepted, full-scale system process to purify domestic wastewater. Since that time, the United States and many other nations have utilized this process and variations to properly treat sewage. Federal Law 92-500 supports our nation's commitment to provide secondary treatment for all domestic wastewater.

This commitment is presently being extended to on-site sewage treatment facilities. **Hydro-*Action*®** has been a visible part of this effort since 1989. We have manufactured numerous products to provide individuals with a means of proper, effective, efficient, and affordable on-site wastewater treatment. Our professional commitment to market needs and customer service have enabled us to reach our goal of providing effective products that assure a safe, reusable effluent. We are helping Mother Nature protect our environment and our most valuable natural resource: water.

Our continuing mission is to develop and manufacture individual on-site wastewater treatment facilities that meet society's needs in the field. This manual is a part of that dedication to customer service.

Hydro-*Action*® AP Series Aerobic Treatment Units are among the most advanced on-site products available today. They are state-of-the-art extended aeration, activated sludge wastewater treatment facilities. The improvements in these units make them not only extremely efficient operational units but also the most easily maintainable system in the industry.

By following the instructions in this manual, you will be providing yourself with the best on-site wastewater treatment and service. We invite you to share in our pride of the AP Series Treatment Units.

This manual includes information on the AP-500, AP-600, AP-750, AP-1000G & AP-1500G wastewater treatment plants. These units may be installed with either a platform mounted OPS® (operations/control center) or a Remotely Located OPS®. Installation needs vary, so your on-site wastewater system may contain some of the following auxiliary components along with the treatment plant:

- Pretreatment tank
- Pump/holding tank
- Alarm systems
- Equipment for chosen effluent disposal method (drip irrigation, spray irrigation, gravel-filled drain field, pressure dosing, etc.)
- Chlorinator / UV Disinfection Unit

The certified **Hydro-*Action*®** dealer or installer of your **Hydro-*Action*®** AP Series wastewater treatment plant is responsible for completing and submitting to us the Installation Warranty Information to properly activate your **Hydro-*Action*®** Product Warranty.

We are eager to assist you with any questions or problems. Please contact **Hydro-*Action*®** at 800.370.3749 to request assistance from our Customer Service or Engineering Departments

SECTION 1.0: Plant Routine Inspection and Service Instructions

1.1: Each site should be inspected and serviced by following these simple instructions. As each state may have differences due to selected disposal options, refer to our website and inspect to determine which options are present then proceed with the following instructions.

1.1.1: Upon arrival at the site, remove the tamper-resistant screws from the **Hydro-*Action*®** plant access cover and the Platform Mounted OPS® or Remotely l Located OPS® enclosure. Then remove the access cover and enclosure. Set the security screws and covers in a protected place for later reassembly.

1.1.2: Collect an activated sludge sample from the aeration compartment. The sample size should be approximately one quart. Collect the sample as soon as possible; you can perform other work while the solids are settling and thereby reduce your inspection time at the site. Use this sample to run the sludge volume test (15 minutes settable solids ml/L test). To perform this test a one-liter graduated cylinder or any tall, straight-sided, clear glass container, about one-quart in capacity, will be needed. Divide the container into 10 equal parts using a waterproof marker, thus signifying 0 to 100%.

a. Immediately after sample is collected, fill graduated container to 100% mark.

b. Allow sample to stand for 15 minutes.

c. Measure sludge volume by locating interface between clarified effluent and settled sludge on graduations. Interface should be between the 20% and 60% marks, indicating a well-functioning plant. Values less than 20% or greater than 60% indicate there is a problem. Sludge layer should be chocolate in color and full of very small particles resembling small pieces of sponge. Refer to the **Hydro-*Action*®** Plant Condition Chart, section 4.12.

1.1.3: As turbulence in the aeration compartment caused by the rising fine air bubbles can be seen, observe any significant changes in mixing and aeration characteristics. If insufficient mixing or poor aeration is observed, refer to Section 1.1.4a. Both diffuser assemblies should appear to have equal turbulence. This is an indication of proper diffuser assembly and diffuser operation.

1.1.4: Proper aeration in the **Hydro-*Action*®** AP-Series is maintained by performing the following maintenance operations:

a. Clean or replace the air pump inlet/outlet filters during routine inspections; inspect the aeration compartment surface through the access port to determine the amount of turbulence caused by air coming from each diffuser assembly. Both diffuser assemblies should appear to have equal turbulence. This is an indication of proper diffuser assembly and diffuser operation.

b. Locate the Schrader air pressure valve on the PVC air pump discharge line. Unscrew the protective cap and connect the quick chuck pressure gauge. Read and record the pressure. If the pressure equals or exceeds 3.5 psig, it is time to replace the air diffuser stones on the diffuser assemblies (refer to Section 3). After pressure reading is complete, remove the quick-chuck pressure gauge and replace the protective cap on the Schrader air pressure valve.

Note: Whenever replacing the **Hydro-*Action*®** diffuser stones, replace all stones—not just a few. Replacement parts can be obtained from **Hydro-*Action*®.**

1.1.5: To replace air diffuser stones, refer to Section 3.0.

1.1.6: Using a clean, clear sample bottle catch an effluent sample from the pump tank or other discharge point. Effluent should have a non-offensive odor and be clear in color. If results differ from these refer to section 4.0, Plant Troubleshooting Guide.

1.1.7: Check the surface of the clarification compartment for floating solid or scum buildup. If build-up is found, remove it using a small net with very fine mesh and dispose of off-site according to all federal, state, and local regulations. (Material may be returned to system upstream of plant through cleanout.) Using a garden hose, spray a high-pressure stream of water into clarifier, breaking up any remaining floating solids. Clean any over spray from the general area.

1.1.8: Activate liquid level alarm by raising and lowering float in clarifier to test both audible and visible alarms. Disrupt the air pressure by disconnecting the air pressure tubing from the electrical enclosure inside OPS® to test air pressure alarms. If any problem is experienced with alarm functions, make necessary adjustments, corrections, and/or repairs. If optional remote alarm has been installed, be sure that its audible and visual alarms are also working correctly.

1.1.9: The switch indicated "normal/silence" on OPS® models 50-11, 20, -30 & -32 is used to test the alarms, silence an alarm condition, or is left in the normal on position. The normal position of the mode is for normal operation of the plant and silence is a mode that will disrupt both the audible and visual alarm. Move the switch to the left and hold to test the alarms. The test switch will reset itself automatically. These alarms should always be tested before leaving the site to assure they are operational.

1.1.10: If optional effluent pump is included on system, activate pump float switch to assure effluent pump is operational; set and adjust timers as required (if installed).

1.1.11: Reinstall **Hydro-*Action*®** access covers being sure to install and tighten tamper-resistant screws to prevent unauthorized plant entry.

1.2: Each site visit requires an investigation of the solids inventory within the wastewater treatment plant and a determination of when excess solids need to be removed from the system. Follow these procedures in evaluating solids inventory:

a. **Hydro-*Action*®** plant inspection and service should be performed a minimum of every six (6) months. This inspection and service includes performing a sludge volume test, which is an indicator of plant performance. (Refer to section 4.0, Plant Troubleshooting Guide.)

b. When sludge volume in plant aeration compartment reaches 60% to 80% it is time to pump the plant and pretreatment tank (if included). This is usually necessary every two (2) to six (6) years.

1.3: Follow these procedures to pump the sludge solids from the treatment tanks. A qualified service technician should oversee the work performed.

1.3.1: Remove the plant access cover.

1.3.2: Refer to installation worksheet to determine which tanks and auxiliary equipment are included on this particular installation (i.e., pretreatment tank, surge tank, pump tank, access covers of different units). Remove pump tank access cover (if included). If necessary, use a shovel to dig down and expose the pretreatment tank access covers and remove them. Remove the clean-out adapter plug from the outlet tee fitting. The tanks are now ready to be pumped.

1.3.3: The suction hose should be positioned to be very near the bottom of the tanks. Care should be taken not to damage internal components. The plant and other tanks should be washed and cleaned while they are being pumped. The waste from the tanks should be disposed of in compliance with local, state, and federal laws.

1.3.4: It is important that care is taken when pumping plant and any other tank to assure that hydraulic displacement of tanks (floating of tanks) does not occur. Tank flotation may occur whenever water and solids are removed from the tank when high groundwater conditions exist. Any source of water in the soil around the plant installation could cause the tank to float. Water sources may include rainfall, springs, creeks, bayous, rivers, lakes, and coastal areas.

Proper precautions are therefore required to prevent tank flotation due to hydraulic displacement.

These precautions include, but are not limited to, the following:

• Plant location — choose a site that will minimize possible groundwater saturation. Consider seasonal water table and soil conditions in the area of installation. Do not locate the plant in a low spot in the ground where water tends to pool or at the edge of any natural body of water. If such a location cannot be avoided, call **Hydro-*Action*®** for technical advice.

• Whenever a tank is pumped, do not remove more than one-half of the capacity of the tank. It is recommended that you pump the tank during dry seasons only. However, if tank must be pumped during the wet season, watch for upward movement of the tank while pumping is being done. If upward movement is detected during pump, **immediately stop pumping water out of the tank and refill the tank to stop flotation.** Each site must be evaluated on a case-by-case basis to determine the best time to remove water from the tank and prevent flotation.

1.3.5: Replace the pre-treat, plant access, and pump tank access cover (if included), being sure to reinstall and tighten the **Hydro-*Action*®** tamper-resistant screws to prevent unauthorized plant entry. **Note**: Plant and other tanks should be filled with water before leaving site.

1.4: Normal maintenance on the **Hydro-*Action*®** AP Series plant will include:

Every Six (6) Months:

a. Maintaining aeration system and air diffusers.
b. Maintaining air pump.
c. Removing scum from clarifier.
d. Inspecting and testing plant alarms.

Every Two (2) to Six (6) Years:

e. Pumping excess sludge from plant.

Note 1: The owner has been informed that replacement parts can be obtained from a **Hydro-*Action*®** Certified Dealer.

Note 2: Pumping the plant is usually necessary every two (2) to six (6) years; however, there is no set time because loadings vary from household to household. Access to the plant is accomplished through the access opening, which is at surface grade. When a **Hydro-*Action*®** plant is being pumped, a qualified service technician should oversee the job. Care should be taken not to damage internal components. The plant should be washed and cleaned while it is being pumped. The waste from the plant must be disposed of in compliance with all federal, state, and local laws.

SECTION 2.0: Operating Instructions

2.1: The **Hydro-*Action*®** AP Series Plant has been designed and built to provide efficient, dependable, and reliable service. However, as with any individual wastewater treatment plant, routine periodic service is required. When proper preventive maintenance is performed, the **Hydro-*Action*®** plant will operate at designed performance levels to give years of satisfactory treatment of domestic wastewater.

2.2: Local **Hydro-*Action*®** authorized representatives are required to perform all routine inspections for the first two (2) years from the original date of installation. At the time of inspection the plant will be checked for proper operation. If a problem exists, service will be performed at no charge to the owner, unless the required maintenance is not warranty related. At the end of the two (2) year initial service period, the local representative will make available a continuing service policy. This extended service is available for a nominal fee. Rep will also provide O&M agreement as well as a copy of the warranty policy.

2.3: The **Hydro-*Action*®** OPS® (Operations/Control Center) is equipped with an alarm beacon and an audible horn alarm. Also on the OPS® should be the name, address, and telephone number of the local servicing dealer. An optional remote alarm with audible and visual alarms

may also be present. Should either alarm come on, the owner is instructed to call the local dealer. After a power failure, if an alarm remains on for more than 30 minutes the owner is instructed to call the local dealer immediately. To silence audible alarm while waiting for service technician to arrive, owner should locate the switch on outside face of the OPS® enclosure labeled "normal/silence" and push it to the "silence" (right) position. Visual alarm beacon will remain illuminated.

2.4: The **Hydro-*Action*®** AP-Series Plant will handle all domestic wastewater. The term domestic wastewater refers to rapidly biodegradable material. To keep maintenance at a minimum and to prevent the plant from malfunctioning, the following guidelines need to be followed:

• Since aerobic bacteria are responsible for treating the wastewater, inorganic or non-rapidly biodegradable materials should not be put into the plant. Examples of improper items are: plastic products, rubber products, sanitary napkins or tampons, washcloths, cigarette butts, melon seeds, coffee grounds, egg shells, matches, some food items such as corn husks, grape vines, etc.

• Do not introduce cooking grease or large amounts of oil into plant; instead pour it into a container and dispose of it properly.

• To minimize pump-out frequency, limit use of garbage disposals.

• Lint from lint catchers, hair, etc., should be disposed of in the trash and not washed down the drain.

• Water softener backwash should not be routed through the system. Another source of disposal should be used. Check our state specific portion of our website for bypass method to be used.

• Diapers can be rinsed out in the toilet; however, do not flush cloth or disposable diapers down the toilet.

• Large amounts of harsh chemicals, high foaming detergents, disinfectants or any substance that kills bacteria must not be discharged into the plant.

• The plant will not perform to its fullest capabilities if volumetric overload is allowed to occur. This occurs whenever excessive water, above the designed flow rate, is allowed into the plant. Excessive water use or leaking plumbing fixtures may cause this condition.

Hydro-*Action*® Authorized Representatives & Technicians are asked to inform homeowners of these guidelines. Too often a malfunctioning treatment unit is due to abuse that can be avoided with simple education.

2.5: Other than for the mechanical and structural working of the plant itself, **Hydro-*Action*®** is not responsible for the in-field operation of a plant. The proper operation of this or any other individual wastewater plant depends upon proper organic and hydraulic loading of the plant. We cannot control the loading and thereby control the amount of harmful substances that may be discharged into the plant. Only the users of a plant can control what enters the unit. Therefore, we provide a comprehensive owner's manual that outlines substances that should be kept out of the plant.

2.6: The **Hydro-*Action*®** AP-Series must be installed and maintained according to factory specifications. No modifications of equipment or design are allowed. Modification of the plant will void warranty and invalidate NSF certification of plant.

2.7: OPS® models 50-30 or 50-32 include a Omeron micro-dose timer. The micro-dose timer is utilized in drip applications. The 50-30 is a 24-hour time clock with 15 minute incremental settings. The 24-hour timer is used in spray or light dosage applicationss. If for some reason their is a loss of power, the timers may need to be reset. However, the treatment plant will immediately begin rejuvenating. See the Technical Manual section of timers in Appendix 3.

SECTION 3.0: Diffuser Stone Replacement

3.1: With plant access cover removed, reach in and disconnect the flexible airline hoses from retainer clamps. Then remove diffuser assemblies through the plant access opening.

3.2: Disconnect and remove diffuser assemblies from the flexible airline hoses. Remove diffuser assembly locknuts, gaskets, and diffuser stones. Now wash and clean all diffuser assembly components. Discard original diffuser stones and replace with new ones. Reassemble and reconnect the diffuser assemblies in reverse order, lubricating all gaskets and making sure all gaskets and check valves are in the proper place and in good condition before tightening.

3.3: Reattach the diffuser assemblies to flexible airline hoses and reattach flexible airline hoses to retainer clamps. Replace diffuser assemblies into **Hydro-*Action*®** plant by lowering the diffuser assemblies with attached anchor to the bottom of aeration tank.

Note 1: Securely tighten all connections by hand being sure not to over-tighten and not to push the gaskets out of the gasket seat areas. All connections must be properly sealed to assure trouble-free diffuser operation.

Note 2: Diffuser stones are to be replaced whenever the pressure reading at the schrader valve on the discharge side of the air pump equals or exceeds a reading of 3.5 psig on AP Series.

SECTION 4.0: Plant Troubleshooting Guide

4.1: The **Hydro-*Action*®** AP Series plant has proven to be very effective and reliable in the treatment of domestic wastewater. The problems outlined here occur only in a very small percent of total installations. They can all be corrected and most can be prevented.

4.2: When the owner/user calls, ask him or her to describe the problem in detail and determine the plant age and service history from your records. This information is then used in preparation for the service call.

4.3: First perform a routine service call as described in section 1.0, Plant Routine Inspection and Service Instructions.

4.4: If routine servicing does not solve the problem, go through the steps listed below.

4.5: Verify model number of plant and OPS® with those in records. If this is a new installation, you should verify that the plant and all its components were installed correctly and in accordance with manufacturers and regulatory agency requirements. See **Hydro-*Action*®** AP Series Installation Manual, available from **Hydro-*Action*®.**

4.5.1: Inspect plant to verify that the **Hydro-*Action*®** plant is installed properly and is not damaged. Plant should be level and internal components should be in proper place and correct working order. Please fill out the Installation Checklist.

4.5.2: Check to see that effluent disposal method is allowing for proper level to be maintained in plant. High level in plant can adversely affect performance.

4.6: After confirming that **Hydro-*Action*®** plant is installed properly and is not damaged, check the operational and maintenance conditions of the plant to determine if it is performing correctly. To do this run a sludge volume test as described in section 1.0. compare your findings with the conditions given in the **Hydro-*Action*®** Plant Condition Chart, section 4.12. Follow the recommended actions required to return the plant to its proper operating conditions.

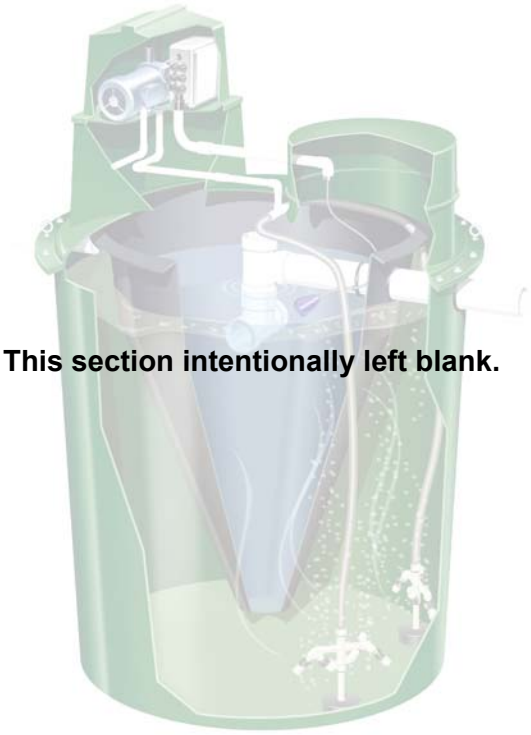
4.7: The alarms supplied with this wastewater treatment plant provide the owner with a secure, reliable, dependable, and economical means of notification for most malfunctions of the plant that would lead to producing an unsatisfactory effluent. These alarms include notification for problems of air pump failure, aeration piping malfunctions, and high water level. These alarms need to be inspected and tested during each plant operation and maintenance site visit. If an optional remote alarm has been installed, it should also be inspected and tested during each site visit.

4.8: To gain access to the electrical controls and air pump, remove the security screws holding the OPS® enclosure to the base.

4.9: The switch indicated “normal/silence” on OPS® models 50-11, 20, -30, & -32 is used to test the alarms, silence an alarm condition, or is left in the normal on position. The normal position of the mode is for normal operation of the plant and silence is a mode that will disrupt the audible alarm. Move the switch to the left and hold to test the alarm. You should see and hear the visible and audible alarms when this mode is selected. The OPS® switch will reset itself automatically.

4.10: If the audible and visual alarms on the outside face of the **Hydro-*Action*®** OPS® enclosure are indicated the problem might be failure in power supply or air pump, or an electrical short in the line between electrical controls and air pump. See Appendix 5, Electrical Controls Schematics, for details of each model. See Appendix 2, Operation & Maintenance Technical Manual for Air Pumps for details on working with air pumps.

4.11: The AP-Series plant is equipped with a high-level float switch and alarm. If the system also includes a pump/holding tank to remove effluent, the **Hydro-*Action*®** electrical controls may include a second high-level alarm. If the owner reports high-level alarm light on, service technician should be sent to correct the problem. A malfunctioning water pump or level float or a plugged discharge could cause the high level conditions. A malfunctioning high-level sensor float could give a false high-level alarm. This problem left uncorrected will lead to system failure and improper wastewater treatment and therefore requires immediate attention.



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4.12: **Hydro-*Action*®** Plant Condition Chart

Hydro-*Action*® Condition	Organic Over loading	Organic Under loading	Toxic Influent	Volumetric Overloading	Well Functioning
Sludge Volume Test Characteristics	Black particles In sludge. Sludge does not settle well. Chunks of floating material above main sludge layer.	Solids do not separate from liquids well. Very little settling usually 5-10 %.	Septic odor. Very little settling. Sludge particles are very small.	Same as organic under loading.	20-60% particles. Particles resemble small pieces of sponge.
Color	Gray Black	Light Muddy Gray	Grayish Black	Light Muddy Gray	Chocolate
Action needed	Diffuser stones may need to be changed to increase dissolved O_2 level and maintain chocolate color. If chocolate color cannot be maintained, then the plant will have to be pumped. (*3)	Look for ways to increase organic load.	Refrain from or reduce the use of toxic substances. (*2)	Reduce flow of liquid to designed GPD. (*1)	None

*(1). Volumetric overloading (flow rate exceeds designed flow rate) could be caused by a number of things. The most common are leaky toilets or faucets. Only sanitary waste (sinks, tubs, washing machines, toilets, etc.) should be allowed in the **Hydro-*Action*®** plant. To check if excess water is entering the plant, observe plant discharge point when house facilities are not in use.

*(2). Find out if owner is using large amounts of chemicals such as unusual amounts of bleach, disinfectants, photographic wastes, etc. Also check to see that water softener backwash is not allowed in plant. This can cause a chemical imbalance and destroy needed bacteria. Backwash should be routed to a separate disposal area. Any unusual types of waste not normally associated with a household should be kept out.

*(3). When **Hydro-*Action*®** plant and pretreatment tank are being pumped, a qualified service technician should oversee the job. Care should be taken not to damage internal components. Plant and pretreatment tank should be washed and cleaned as they are being pumped. The waste from the tanks should be disposed of in compliance with state and federal law. **Hydro-*Action*®** recommends pumping the plant every 2 to 6 years; however, there is not a set time because loading varies from household to household. Care should be taken when pumping plant and pretreatment tank. Empty tanks can be hydraulically displaced (float tank) by ground water. If soil is water-saturated tanks should not be completely emptied. Wasting sludge (solids) can be accomplished without completely empty tanks.

SECTION 5.0 Hydro-*Action*® AP Series Plant Specifications.

Power Specifications by Pump Model

	Hi-Blow 100	Hi-Blow 120	Hi-Blow 150	Gast 1/4 HP	Gast 3/4 HP
Voltage (VAC)	120	120	120	115	115/220
Current (Amps)	1.55	2.1	2.1	3.9	7.8/3.9
Power (Watts)	186	252	252	120	120/560
Frequency (Hertz)	60	60	60	60	50
Flow (Cfm)	5.2	6.1	8.6	4.3	8.2
Max Pressure (Psi)	4.5	4.5	4.5	5.0	7.0

Design Flow by Model (Gallons Per Day)

AP 500----------→500 Gal/Day
AP 600----------→600 Gal/Day
AP 750----------→750 Gal/Day
AP 1000----------→1000 Gal/Day
AP 1500----------→ 1500 Gal/Day

$CBOD_5$ (Pounds Per Day)

AP 500----------→1.25 Lbs/Day
AP 600----------→ 1.5 Lbs/Day
AP 750----------→ 1.88 Lbs/Day
AP 1000----------→ 2.50 Lbs/Day
AP 1500----------→ 3.75 Lbs/Day

Aeration Pump Choices by Model

AP 500--→(1) ¼ HP Rotary or (1) 100 Linear
AP 600--→(1) ¼ HP Rotary or (1) 120 Linear
AP 750--→(1) ¼ HP Rotary or (1) 150 Linear
AP 1000→(1) 3/4 HP Rotary or (2) 100 Linear
AP 1500→(1) 3/4 HP Rotary or (2) 120 Linear

SECTION 6.0: Process Description

6.1: The **Hydro-*Action*®** AP Series individual wastewater treatment plant is a self-contained, extended aeration, aerobic treatment facility utilizing the activated sludge process. The plant consists of a cylindrically shaped aeration tank with an offset service access, a unique cone shaped clarification compartment and an outlet tee-assembly. Two fine-bubble air diffuser assemblies with ceramic stone diffusers and **Hydro-*Action*®** efficient rotary air pump are combined to provide effective, efficient, and economical aeration.

6.2: Domestic wastewater enters the aeration compartment and is mixed thoroughly with the already present mixed liquor suspended solids (MLSS) activated sludge. The injection of air through the porous ceramic air diffusers placed near the bottom of the aeration chamber is responsible for this complete mixing. The fine-bubble diffusers and the vortex area between diffuser assemblies produce a high magnitude of air diffusion and therein provide ample mixing and a more than generous quantity of dissolved oxygen to maintain the aerobic environment even under extreme conditions.

6.3: Hydraulic displacement causes the mixed liquor to enter the clarification compartment and move upward toward the outlet tee-assembly. Due to the calm conditions in the clarifier, suspended solids settle to the bottom where they are remixed with the Mixed Liquor Suspended Solids (MLSS) for additional biological treatment. The remaining clarified effluent leaves the plant via the outlet tee assembly and discharge line.

6.4: The AP Series ATUs are operated by the OPS®. The OPS® integrates the electrical controls, visible and audible alarms and air pump in a protective polyethylene enclosure. The OPS® can be either platform mounted on the plant or remotely located. These features plus; the offset access, flexible air hose, and anchored diffuser assemblies make the plant extremely reliable and easy to service. An optional visible and audible alarm may be added to remotely locate to an area of your choice.

6.5: The technology used in the **Hydro-*Action*®** plant allows it to produce excellent effluent quality, which thereby meets all ANSI\NSF International Standard 40 class I and the Environmental Protection Agency's

requirements of a secondary treatment process. NSF requires that a Class I plant shall be shown to meet EPA secondary treatment guidelines for CBOD5, TSS, and pH. The **Hydro-Action®** AP Series ATUs satisfy all these requirements.

SECTION 7.0: Safety

7.1: Safety is an important issue in our business since we deal with one of the more potentially health hazardous materials known: raw sewage. Domestic wastewater carries in it members of a specialized group of life known as microorganisms. Such microorganisms are bacteria, viruses, algae, actinomycetes, protozoa, fungi, rotifers, crustaceans, and other members of both the plant and animal worlds. The function of a wastewater treatment plant is to treat the water to a degree that the effluent is relatively free of pathogenic bacteria and nuisance microorganisms. Until the wastewater entering the plant has had sufficient time for treatment and disinfection, it may contain any number of the harmful organisms that cause disease.

7.2: As raw wastewater may and usually does contain some level of unsafe microorganisms, proper respect and care must be given to safety. When coming into contact with raw sewage, **do not fear** the contact, but **do take proper precautions** to avoid potential danger.

7.3: Follow these simple safety precautions whenever exposed to wastewater:

- Wear disposable rubber gloves when handling wastewater contaminated items or chlorine tablets.

- Always wash with soap and water after handling any contaminated item. The use of good bactericide soap is strongly recommended.

- Always dispose of scum, rags, trash, debris, or soiled material in a proper waste container.

- If a wastewater spill or leak occurs in a yard, flush area with plenty of clean water and disinfect. If a spill or leak occurs in the house, clean with a dilute solution of bleach.

- Treated effluent from a **Hydro- A*ction*®** or other treatment unit may still contain harmful microorganisms. Careful attention must be used when dealing with any form of wastewater or effluent.

- If an illness or disease is suspected to have come from exposure to sewage, get proper medical attention immediately. When proper treatment is given the remedy and cure will be rapid and less of a problem. There are some serious diseases that could be transmitted by contact with raw sewage, take the proper precautions and be safe!

- Report all accidents relating to sewage exposure to the proper supervisory personnel.

Appendix 1: OPS Explanation

50-11 Series OPS® Wastewater Plant Control

This OPS® provides total control of the aerobic unit including air pump and alarms. Other features include separate disconnect switch (which cuts off power to all electrical components) with an optional lockout feature. It requires a single circuit 120 volt / 20 amp feed.

Typical Applications Include:

- Direct Discharge
- Gravity Flow to Gravel Drain Fields
- Gravity Flow to Leaching Chambers or any disposal method where a pump is not required.

Equipment Included:

1 – **Hydro-Action®** Air Pump
1 – Polyethylene OPS® Base & Enclosure
1 – Electrical Control

Small Components Include:

Wiring harnesses, electrical connectors, liquid tight compression fittings, air tubing, shraeder valve, audible alarm, visual alarm, and various other components which provide for integration of the OPS®.

50-20 Series OPS®
Wastewater Plant / Pump Tank Control

This OPS® provides total control of the aerobic unit and pump tank including air pump, water pump and alarms. Other features include two-branch circuit breakers, separate disconnect switch (which cuts off power to all electrical components) with an optional lockout feature. It requires a single circuit 120 volt / 30 amp feed.

Typical Applications Include:

- Spray Irrigation
- Pumping to Gravel Drain Fields
- Pumping to Low Pressure Dosing Systems
- Pumping to Leaching Chambers or any disposal method requiring a pump where timed dosing is not required.

Equipment Included:

1 – **Hydro-Action®** Air Pump
1 – Polyethylene OPS® Base & Enclosure
1 – Electrical Control

Floats Switches Required:

1 – Water Pump On/Off Float
1 – Pump Tank High Level Alarm Float

Small Components Include:

Wiring harnesses, electrical connectors, liquid tight compression fittings, air tubing, shraeder valve, audible alarm, visual alarm, and various other components which provide for integration of the OPS®.

50-30 Series OPS®
Wastewater Plant / Pump Tank Control w/ 24 HR Timer

This OPS® provides total control of the aerobic unit and pump tank including air pump, water pump and alarms. Other features include two-branch circuit breakers, separate disconnect switch (which cuts off power to all electrical components) with an optional lockout feature and a 24 hr. timer. It requires a single circuit 120 volt / 30 amp feed.

Typical Applications Include:

- Spray Irrigation
- Pumping to Gravel Drain Fields
- Pumping to Low Pressure Dosing Systems

• Pumping to Leaching Chambers or any disposal method requiring a pump where 24 hr. – 15 minute increment timed dosing is required.

Equipment Included:

1 – **Hydro-Action®** Air Pump
1 – Polyethylene OPS® Base & Enclosure
1 – Electrical Control w/ 24 hr. – 15 min. Timer

Floats Switches Required:

1 – Water Pump On/Off Float
1 – Pump Tank High Level Alarm Float

Optional Float Switch:

1 – Pump Tank Timer Override Float

Small Components Include:

Wiring harnesses, electrical connectors, liquid tight compression fittings, air tubing, shraeder valve, audible alarm, visual alarm, and various other components which provide for integration of the OPS®.

50-32 Series OPS®
Wastewater Plant / Pump Tank Control w/ Micro-dose Timer / For Use w/ Hydro-action Turtledrip.

This OPS® provides total control of the aerobic unit and pump tank including air pump, water pump and alarms. Other features include high-level override, two-branch circuit breakers, separate disconnect switch (which cuts off power to all electrical components) with an optional lockout feature with a fully adjustable repeat cycle (micro-dosing) timer. It requires a single circuit 120 volt / 30 amp feed.

Typical Applications Include:

• Drip Irrigation
• Pumping to Gravel Drain Fields
• Pumping to Low Pressure Dosing Systems
• Pumping to Leaching Chambers or any disposal method requiring a pump where micro-dosing is desired with single float high level override / high level alarm.

Equipment Included:

1 – **Hydro-Action®** Air Pump
1 – Polyethylene OPS® Base & Enclosure
1 – Electrical Control w/ Micro-dosing Timer

Floats Switches Required:

1 – Water Pump On/Off Float
1 – Pump Tank High Level Alarm Float/Timer Override Float

Small Components Include:

Wiring harnesses, electrical connectors, liquid tight compression fittings, air tubing, shraeder valve, audible alarm, visual alarm, and various other components which provide for integration of the OPS®.

RV03-RV05 SERIES OILLESS COMPRESSORS

OPERATION & MAINTENANCE MANUAL

Model #RV03

Model #RV03 Shown with Rear Motor Fan

Thank you for purchasing this Gast product. It is manufactured to the highest standards using quality materials. Please follow all recommended maintenance, operational and safety instructions and you will receive years of trouble free service.

IMPORTANT: PLEASE READ THIS MANUAL AND SAVE FOR FUTURE REFERENCE

General information

- **Standard Rebuild Clearances:** Top: .002”
  Ends: .0015” - .005”
- **Model numbers ending in “X”** have automatic thermal protectors which protect the motor by shutting the motor off if it overheats. The motor will automatically restart once the motor has cooled.

Product Use Criteria:

- Pump only clean, dry air.
- Operate at 32ºF - 104ºF (0ºC - 40ºC).
- Protect unit from dirt & moisture.
- Do not pump flammable or explosive gases or use in an atmosphere that contains such gases.
- Protect all surrounding items from exhaust air. This exhaust air can become very hot.
- Corrosive gases and particulate material will damage unit. Water vapor, oil-based contaminants or other liquids must be filtered out.
- Consult your Gast Distributor before using at high altitudes.
- Oil-Less rotary-vanes require NO lubrication.
- Sealed bearings are grease packed.
- Use of petroleum or hydrocarbon products will reduce carbon-vane service life.

GAST
A Unit of IDEX Corporation

ISO 9001 & 14001 CERTIFIED

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Your safety and the safety of others is extremely important.

We have provided many important safety messages in this manual and on your product. Always read and obey all safety messages.

This is the safety alert symbol. This symbol alerts you to hazards that can kill or hurt you and others. The safety alert symbol and the words "DANGER" and "WARNING" will precede all safety messages. These words mean:

DANGER

You will be killed or seriously injured if you don't follow instructions.

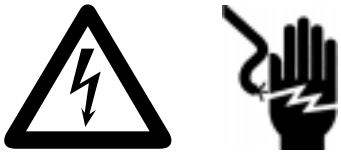
WARNING

You can be killed or seriously injured if you don't follow instructions.

All safety messages will identify the hazard, tell you how to reduce the chance of injury, and tell you what can happen if the safety instructions are not followed.

INSTALLATION

WARNING



Electrical Shock Hazard

Disconnect electrical power at the circuit breaker or fuse box before installing this product.

Install this product where it will not come into contact with water or other liquids.

Install this product where it will be weather protected.

Electrically ground this product.

Failure to follow these instructions can result in death, fire or electrical shock.

Correct installation is your responsibility. Make sure you have the proper installation conditions and that installation clearances do not block air flow.

Blocking air flow over the product in any way can cause the product to overheat.

Mounting
This product can be installed in any orientation. Mounting the product to a stable, rigid operating surface and using shock mounts will reduce noise and vibration.

Plumbing
Remove plugs from the IN and OUT ports. Connect with pipe and fittings that are the same size or larger than the product's threaded ports. Install relief valves and gauges at inlet or outlet, or both, to monitor performance. Check valves are required to prevent back streaming through the pump.

Accessories
The product's intake and exhaust filters will provide adequate filtration in most applications. Consult your Gast representative for additional filter recommendations.

Motor Control
It is your responsibility to contact a qualified electrician and assure that the electrical installation is adequate and in conformance with all national and local codes and ordinances.

Determine the correct overload setting required to protect the motor (see motor starter manufacturer's recommendations). Select fuses, motor protective switches or thermal protective switches to provide protection. Fuses act as short circuit protection for the motor, not as protection against overload. Incoming line fuses help to withstand the motor's starting current. Motor starters with thermal magnetic overload or circuit breakers protect motor from overload or reduced voltage conditions.

The wiring diagram attached to the product provides required electrical information. Check that power source is correct to properly operate the dual-voltage motor.

OPERATION

WARNING

Injury Hazard

Product surfaces become very hot during operation, allow product surfaces to cool before handling.

Air stream from product may contain solid or liquid material that can result in eye or skin damage, wear proper eye protection.

Failure to follow these instructions can result in burns, eye injury or other serious injury.

It is your responsibility to operate this product at recommended pressures or vacuum duties and room ambient temperatures.

Model numbers ending in "X" have automatic thermal protectors which protect the motor by shutting the motor off if it overheats. The motor will automatically restart once the motor has cooled.

Start Up
If motor fails to start or slows down significantly under load, shut off and disconnect from power supply. Check that the voltage is correct for motor and that motor is turning in the proper direction. Vane life will be drastically reduced if motor is not operating properly. Vanes can break or be damaged if motor/pump runs in the wrong direction.

MAINTENANCE

WARNING

Electrical Shock Hazard

Disconnect electrical power supply cord before performing maintenance on this product.

If product is hard wired into system, disconnect electrical power at the circuit breaker or fuse box before performing maintenance on this product.

Failure to follow these instructions can result in death, fire or electrical shock.

WARNING

Injury Hazard

Product surfaces become very hot during operation, allow product surfaces to cool before handling.

Air stream from product may contain solid or liquid material that can result in eye or skin damage, wear proper eye protection.

Flush this product in a well ventilated area.

Failure to follow these instructions can result in burns, eye injury or other serious injury.

It is your responsibility to:

- **Regularly inspect and make necessary repairs to product in order to maintain proper operation.**
- **Make sure that pressure and vacuum is released from product before starting maintenance.**

Check intake and exhaust filters after first six months of operation. Clean filters and determine how frequently filters should be checked during future operation. This one procedure will help to assure the product's performance and service life.

General Maintenance

1. Remove end cap and filters. Inspect filters for rips,tears, cuts, brittleness and excessive foreign material.
2. Clean filters if in good condition with compressed air. Re-inspect for wear conditions. Set filters aside.
3. Check both internal and external filter felts (#8 and #11 on exploded view) for foreign material. If felts are dirty or worn, replace with new felts.
4. Check condition of O-ring on internal filter. It should be soft and flexible. Replace if it is not.
5. Remove and inspect muffler box. Clean box. Set box aside. (Not all models have a muf fler box.)
6. Check gasket for cracks or tears. Install new gasket if any cracks or tears appear. Replace gasket.
7. Reinstall muffler box. Torque bolts to 90-120 in. lb.
8. Reinstall filters or install new filters if required. Reinstall end cap finger tight.

Flushing

Flushing this product to remove excessive dirt, foreign particles, moisture or oil that occurs in the operating environment will help to maintain proper vane performance. There are 2 options for this operation. If Option 1 does not remedy your problem, go on to Option 2.

Use only Gast AH255B Flushing Solvent or other non-petroleum based flushing solvent. Do Not use kerosene or ANY other combustible solvents to flush product.

Option 1

You will need 2 pipe nipples at least 4 inches long with appropriate thread size for the unit involved. No nipples are needed if the unit does not have a muf fler box.

1. Remove filter and muffler cap (#9).
2. Remove 5 bolts. Use a small hammer to tap on muffler box to remove it. Attach pipe nipples where muffler caps were removed.
3. Start product and add flushing solvent to the inlet port. If using liquid solvent, pour several tablespoons directly into the inlet port. If using Gast AH255B, spray solvent for 5-10 seconds into inlet port. Place towel over exhaust port to clean up solvent.
4. Plug inlet port for 20-30 seconds. Listen for changes in the sound of the pump. If pump sounds smooth, go to next step. If pump does not sound like it is running smoothly, installing a Service Kit wil be required (See Service).
5. Release vacuum.
6. Repeat steps 3-5 three or four times.

If Option 1 is not successful, remove the end plate and examine.

Option 2

1. Remove six end plate bolts. (See exploded view.)
2. Use a small hammer to carefully tap on end plate to remove. Do not use a screwdriver to pry of f.
3. Check that vanes are moving freely in and out of vane slots. Replace vanes if more than 50% of the vane extends past the vane slot.
4. Remove vanes and clean both sides with fine emery cloth. Clean end-plate with fine emery cloth.
5. Flush vanes with AH255B solvent and remove all solvent from vanes.
6. Flush body, rotor and end plate with AH255B solvent, then remove all solvent from each part.
7. Check body, rotor and end plate for scoring. If each part is clean and shows no signs of scoring, re-install parts. If scoring appears, send unit to factory or replace with new part(s).
8. Insert vanes, checking that the bevel edges are in the correct direction.
9. Replace end plate. Torque bolts to 90-120 in. lb.
10. Check gasket for damage.
11. Reinstall muffler box. Torque bolts to 90-120 in. lb.

Check that all external accessories such as relief valves and gauges are attached to cover and are not damaged before re-operating product.

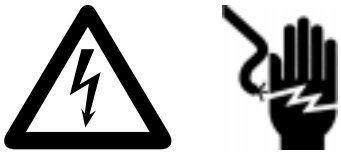
SHUTDOWN PROCEDURES

It is your responsibility to follow proper shutdown procedures to prevent product damage.
NEVER ADD OIL TO THIS OIL-LESS PUMP.

1. Disconnect plumbing.
2. Operate product for at least five minutes without plumbing.
3. Run at maximum vacuum for 10-15 minutes.
4. Repeat step 2.
5. Disconnect power supply.
6. Plug open ports to prevent dirt or other contaminants from entering product.

SERVICE KIT INSTALLATION

⚠ WARNING



Electrical Shock Hazard

Disconnect electrical power supply cord before installing Service Kit.

If product is hard wired into system, disconnect electrical power at the circuit breaker or fuse box before installing Service Kit.

Vent all air lines to release pressure or vacuum.

Failure to follow these instructions can result in death, fire or electrical shock.

Gast will NOT guarantee field-rebuilt product performance. For performance guarantee, the product must be returned to a Gast-authorized facility.

Service Kit contents vary. Most contain vanes, gaskets and filter parts.

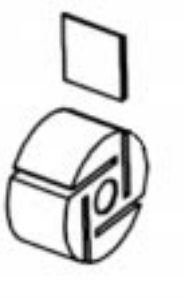
1. Remove filter/muffler parts from front of muffler box.
2. Remove the 5 muffler box bolts.
3. Use a small hammer to tap on box to remove. Do not use a screwdriver.
4. Remove the 6 end plate bolts.
5. Remove end plate. Check direction of bevel edges of vanes then remove vanes.
6. Clean body and rotor slots with AH255B or equivalent flushing solvent. Hand turn the rotor to make sure it rotates freely. Any unusual grinding or scraping sound could indicate worn bearings or scored parts.
7. Check end plate, rotor and body for scoring. Severe scoring or worn bearings will require service at a Gast-authorized facility.

DO NOT remove rotor or motor bolts.

8. Insert vanes, checking that the bevel edges are in the correct direction. See diagram below.
9. Replace end plate. Torque bolts to 90-120 in. lb.
10. Check gasket for damage.
11. Reinstall muffler box. Torque bolts to 90-120 in. lb.

Check that all external accessories such as relief valves and gauges are attached and are not damaged before re-operating product.

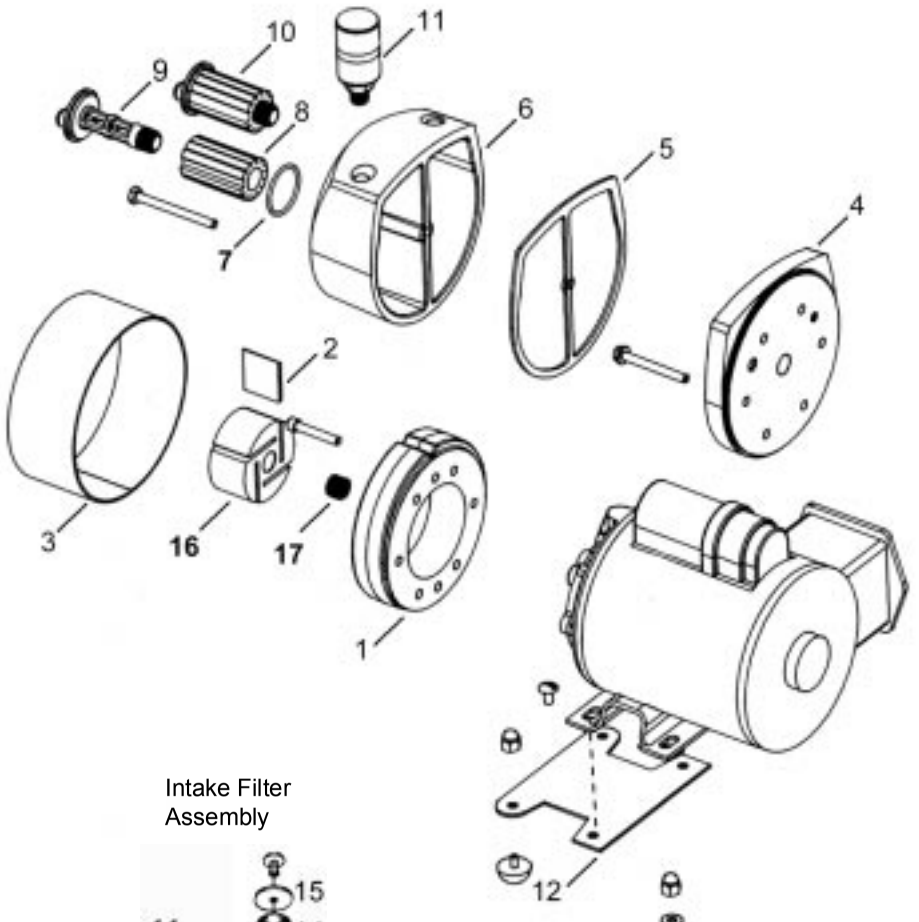
The vanes need to be flush with the curvature of the rotor when installing.



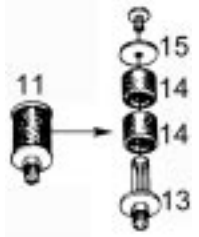
EXPLODED PRODUCT VIEW, PARTS & ORDERING INFORMATION

REF	DESCRIPTION	QTY	RV03-101	RV05-101
1	BODY	1	AK504	AK500
2 *	VANE	4	AH850A	AH850A
3	SHROUD	1	AK502B	AK502B
4	END PLATE	1	AK501	AK501
5 *	GASKET	1	AK521	AK521
6	MUFFLER BOX	1	AK519	AK519
7 *	O-RING	2	AK473	AK473
8 *	FELT	2	AK524	AK524
9	END CAP	2	AK510	AK510
10	END CAP FILTER	2	AK526	AK526
11	ASSEMBLY FILTER / MUFFLER	1	B343B	B343B
12	FOOT SUPPORT KIT	1	AC136	AC136
13	FELT SUPPORT	1	B347	B347
14*	FELT FILTER	2	B344A	B344A
15	SCREEN CAP	1	AJ571	AJ571
16	ROTOR	1	AH775B	AH775B
17	TOLERANCE RING	1	AF105	AF105
	SERVICE KIT	1	K882	K882

* Denotes parts included in the Service Kit. Parts listed are for stock models.
** No Service Kit available, order parts separately. For specific OEM models, please consult the factory. When corresponding or ordering parts, please give complete model and serial numbers.



Intake Filter Assembly



WARRANTY

Gast finished products, when properly installed and operated under normal conditions of use, are warranted by Gast to be free from defects in material and workmanship for a period of twenty four (24) months from the date of purchase from Gast or an authorized Gast Representative or Distributor. In order to obtain performance under this warranty, the buyer must promptly (in no event later than thirty (30) days after discovery of the defect) give written notice of the defect to Gast Manufacturing Incorporated, PO Box 97, Benton Harbor Michigan USA 49023-0097 or an authorized Service Center (unless specifically agreed upon in writing signed by both parties or specified in writing as part of a Gast OEM Quotation). Buyer is responsible for freight charges both to and from Gast in all cases.

This warranty does not apply to electric motors, electrical controls, and gasoline engines not supplied by Gast. Gast' s warranties also do not extend to any goods or parts which have been subjected to misuse, lack of maintenance, neglect, damage by accident or transit damage.

THIS EXPRESS WARRANTY EXCLUDES ALL OTHER WARRANTIES OR REPRESENTATIONS EXPRESSED OR IMPLIED BY ANY LITERATURE, DATA, OR PERSON. GAST'S MAXIMUM LIABILITY UNDER THIS EXCLUSIVE REMEDY SHALL NEVER EXCEED THE COST OF THE SUBJECT PRODUCT AND GAST RESERVES THE RIGHT, AT ITS SOLE DISCRETION, TO REFUND THE PURCHASE PRICE IN LIEU OF REPAIR OR REPLACEMENT.

GAST WILL NOT BE RESPONSIBLE OR LIABLE FOR INDIRECT OR CONSEQUENTIAL DAMAGES OF ANY KIND, however arising, including but not limited to those for use of any products, loss of time, inconvenience, lost profit, labor charges, or other incidental or consequential damages with respect to persons, business, or property, whether as a result of breach of warranty, negligence or otherwise. Notwithstanding any other provision of this warranty, BUYER'S REMEDY AGAINST GAST FOR GOODS SUPPLIED OR FOR NON-DELIVERED GOODS OR FAILURE TO FURNISH GOODS, WHETHER OR NOT BASED ON NEGLIGENCE, STRICT LIABILITY OR BREACH OF EXPRESS OR IMPLIED WARRANTY IS LIMITED SOLELY, AT GAST'S OPTION, TO REPLACEMENT OF OR CURE OF SUCH NONCONFORMING OR NON-DELIVERED GOODS OR RETURN OF THE PURCHASE PRICE FOR SUCH GOODS AND IN NO EVENT SHALL EXCEED THE PRICE OR CHARGE FOR SUCH GOODS. GAST EXPRESSLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE WITH RESPECT TO THE GOODS SOLD. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTIONS SET FORTH IN THIS WARRANTY, notwithstanding any knowledge of Gast regarding the use or uses intended to be made of goods, proposed changes or additions to goods, or any assistance or suggestions that may have been made by Gast personnel.

Unauthorized extensions of warranties by the customer shall remain the customer 's responsibility.

CUSTOMER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF GAST PRODUCTS FOR CUSTOMER'S USE OR RESALE, OR FOR INCORPORATING THEM INTO OBJECTS OR APPLICATIONS WHICH CUSTOMER DESIGNS, ASSEMBLES, CONSTRUCTS OR MANUFACTURES.

This warranty can be modified only by authorized Gast personnel by signing a specific, written description of any modifications.

MAINTENANCE RECORD

DATE	PROCEDURE PERFORMED

TROUBLESHOOTING CHART

Low		High		Pump	Motor	Reason and remedy
Vacuum	Pressure	Vacuum	Pressure	Overheat	Overload	for problem.
●	●	At pump		●	●	Filter dirty. Clean or replace.
	●		At pump	●	●	Muffler dirty. Clean or replace.
●		At pump		●	●	Vacuum line collapsed. Repair or replace.
			●	●	●	Relief valve set too high. Inspect and adjust.
●	●					Relief valve set too low. Inspect and adjust.
●	●	At pump	At pump	●	●	Plugged vacuum/pressure line. Inspect and repair.
●	●					Vanes sticking. Clean or replace.
●	●					Vanes worn. Replace.
●	●			●	●	Foreign material- in pump. Inspect and clean.
●	●			●	●	Motor not wired correctly. Check wiring diagram and line voltage.

We have Gast Certified Service Centers throughout the world. For the most up-to-date listing, contact one of our sales offices below:

World Headquarters
P.O. Box 97
2550 Meadowbrook Rd.
Benton Harbor, MI
49023-0097
Ph: 269/926-6171
FAX: 269/925-8288
www.gastmfg.com

Gast Hong Kong
Unit 12, 21/F, Block B
New Trade Plaza
6, On Ping Street, Shatin
N. T. Hong Kong
Ph: (852) 2690 1008
Fax: (852) 2690 1012
www.gasthk.com

ADDITIONAL TROUBLE SHOOTING FOR AERATION PUMPS

LOW PRESSURE
Make sure intake filter isn't clogged
Vanes are not sticking
No foreign material in pump

UNIT NOT RUNNING
Check breaker
Wrong voltage applied to unit
Motor is wired incorrectly
Motor has dust & dirt inside

HIGH PRESSURE AT PUMP OR GRINDING NOISE
Plugged diffuser causing back pressure on unit
Excessive heat causing bearing grease to dissipate causing noise
Foreign material causing parts to rub against each other.

PUMP OVERHEATING
Plugged diffuser causing back pressure on unit
Foreign material causing parts to rub against each other.
Filter/muffler clogged
Motor incorrectly wired

Unit must be kept clean, dry, and free of foreign material such as dirt, moisture,bugs, and hot temps.
Failure to do so will shorted the life expectance of your unit.

INSTRUCTION MANUAL

OPERATION & MAINTENANCE TECHNICAL MANUAL

HIBLOW SERIES COMPRESSORS

MODELS

HP-40, HP-60, HP-80,
HP-100, HP-100LL, HP-120, HP-120LL,
HP-150, HP-200

This is a hazard alert symbol: ⚠ When you see this symbol, be aware that personal injury or property damage is possible. The hazard is explained in the text following the symbol. Read the information carefully before proceeding.

The following is an explanation of the three different types of hazards:

⚠ **DANGER:** Severe personal injury or death will occur if hazard is ignored.
⚠ **WARNING:** Severe personal injury or death can occur if hazard is ignored.
⚠ **CAUTION:** Minor injury or property damage can occur if hazard is ignored.

GENERAL INFORMATION

⚠ **DANGER:** Do not pump flammable or explosive gases or operate the unit in an atmosphere containing them.

⚠ **CAUTION:** The pump is designed for air only. Do not allow corrosive gases or particulate material to enter the pump. Water vapor, oil-based contaminants, or other liquids must be filtered out.

⚠ **CAUTION:** Ambient temperature should not exceed 40℃(104°F). For operation at higher temperatures, consult the factory.

⚠ **CAUTION:** Close supervision is necessary when any appliance is used by or near children.

This pump's function is to pump air and under no circumstances should it be used to pump any other gases. The pump must not be used for the pumping of fluids, particles, solids or any substance mixed with air, particularly combustible substances likely to cause explosions.

Never lubricate this oil-less pump, the moving parts consist of an actuating rod supported by two special synthetic rubber diaphragms which vibrate laterally, permitting long-term continuous operation. Operation is based upon the principle of electromagnetic vibration which eliminates the need for sliding parts, thereby minimizing power consumption and offering high efficiency.

INSTALLATION

⚠ **WARNING:** To avoid risk of electrocution do not use this product in an area where it could become submerged in water or other liquids. The Canadian (c-UL) pumps need to be stored in a dry location and it is not intended for outdoor use.

⚠ **CAUTION:** Do not block the flow of cooling air around the pump in any way. The life of pump may be reduced or malfunction could occur, if hazard is ignored.

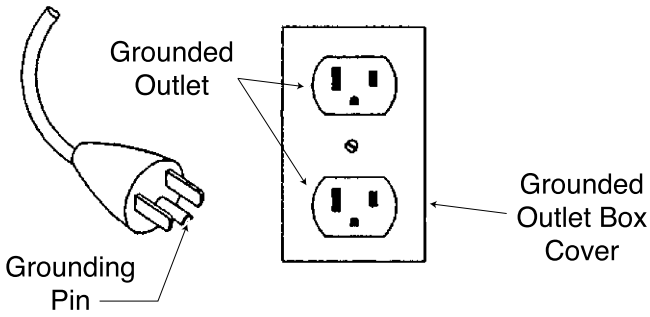
GROUNDING INSTRUCTIONS

FOR ALL GROUNDED, CORD-CONNECTED PRODUCTS

This product should be grounded. In the event of an electrical short circuit, grounding reduces the risk of electric shock by providing an escape wire for the electric current. This is equipped with a cord having a grounding wire with an appropriate grounding plug.
The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances.

⚠ **DANGER:** Improper installation of the grounding plug can result in a risk of electric shock. If repair or replacement of the cord or plug is necessary, do not connect the grounding wire to either flat blade terminal. The wire with insulation having an outer surface that is green, with or without yellow stripes, is the grounding wire.

Check with a qualified electrician or serviceman if the grounding instructions are not completely understood, or if in doubt as to whether the product is properly grounded. Do not modify the plug provided; if it will not fit the outlet, have the proper outlet installed by a qualified electrician.



For a grounded, cord-connected product rated less than 15 amperes and intended for use on a nominal 120 volt supply circuit.

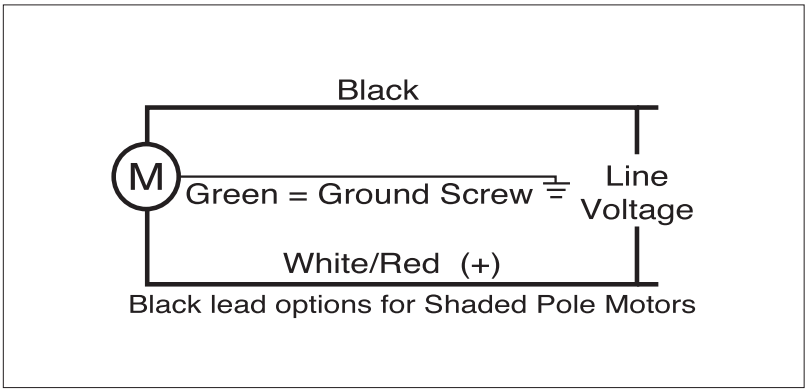
This product is for use on a nominal 120 volt circuit, and has grounding plug. Make sure that the product is connected to an outlet having the same configuration as the plug. No adapter should be used with the product.

FOR PERMANENTLY CONNECTED PRODUCT

This product should be connected to a grounded, metallic, permanent wiring system, or an equipment-grounding terminal or lead on the product(refer to wiring diagram).

WIRING

120V AC Wiring Diagram



EXTENSION CORDS

Use only a 3-wire extension cord that has a 3-blade grounding plug, and a 3-slot receptacle that will accept the plug on the product. Make sure your extension cord is in good condition. When using an extension cord, be sure to use one heavy enough to carry the current that your product will draw. A cord no longer than 100 feet, No.16 AWG extension cord should be used. An undersized cord will cause a drop in line voltage resulting in loss of power and overheating. For outdoor use, use an extension cord that is approved for outdoor use, marked W-or W-A.

MOUNTING

⚠ **CAUTION:** When using the pump to inject air into a liquid, make sure that the pump is higher than the surface level of the liquid, otherwise that liquid may run back into the pump if the power is interrupted.

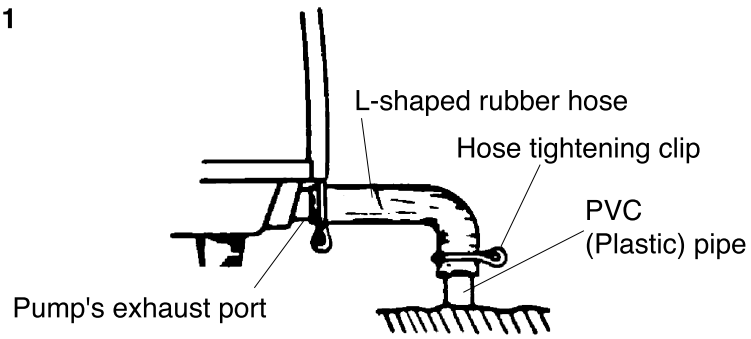
The pump should be in an upright, level position and remain on a stable, rigid operating surface for proper operation.

PLUMBING

Improper connection will cause leakage of air.

HP Series : Connect the pumps exhaust port and PVC(plastic)pipe with an L-shaped rubber hose. Be sure to secure place of connection with a hose tightening clip(Refer to Fig.1).

Fig. 1



STORAGE

Store indoors out of the weather in a dry area. Make certain the electrical cord is placed so there will be no chance of damage.

⚠ **CAUTION:** To avoid risk of electrocution or damage to the pump do not store this unit where it could come into contact with water or other liquids. Store indoors. Inspect compressor and cord for damage prior to putting compressor back into service.

・After the Diaphragm mounting block have been installed, replace with the new Head (Casing) block, reattaching the L-tube, and reinstall the 4 screws holding the Head (Casing) on. (Refer to Fig.4-③or⑤)

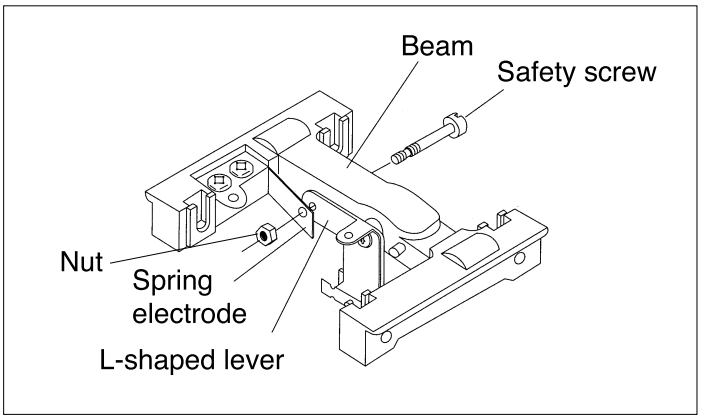
〔3〕 Replacement of Safety Screw (Refer to Fig.6)

SP Switch (For HP-60/HP-80/HP-100/HP-100LL/HP-120/HP-120LL/HP-150/HP-200 Series)

The body of the switch is set on the upper part of the Rod. If the Diaphragm is damaged or unit is dropped, the unusual movement of the Rod will cause the upper part of the Rod to touch the L-shaped lever, contacting the spring terminal, breaking the safety screw. This turns the power off, stopping the pump automatically. This is a built in safety device to prevent any further damage to the pump. To replace SP Screw:

REPLACEMENT SAFETY SCREW PART#
HP-60/HP-80/HP-100/HP-100LL/HP-120/HP-120LL/HP-150/HP-200 ····· PASPSW0200

Fig. 6



・First remove the pump plug from the electrical outlet.

⚠ **WARNING:** All power must be disconnected or deenergized before servicing unit. If hazard is ignored personal injury or property damage is possible.

・Dispose of broken screw. Be sure all debris is removed (may be necessary to turn pump upside down) from unit.
・Fasten screw with plastic nut. The screw is designed so that the nut will turn freely when it is properly fastened, stop tightening when this happens.

〔4〕 Reinstall the Upper housing (Refer to Fig.4)

・Reinstall the 4 screws holding the Frame cover on. (For HP-100/120, Refer to Fig.4-④)
・Reinstall the Sound absorber (except for HP-40, HP-100LL, HP-120LL).
・Reinstall the Upper housing and tighten corner screws. (Refer to Fig.4-①)

OPERATION

⚠ **WARNING:** Lower housing and pump surfaces can become very hot during operation. Do not touch these surfaces until unit has been shut off and allowed to cool.

⚠ **CAUTION:** Carefully examine the air pump after installation. It should not be plugged in if there is water on parts not intended to be wet.

⚠ **CAUTION:** Do not operate if the cord or plug is damaged, or if the pump is malfunctioning, dropped, or damaged in anyway.

⚠ **CAUTION:** Ensure pump is securely mounted prior to operation.

When alternating current is applied to electromagnet as in the figures, the actuating rod moves first in the arrow direction shown in Fig. 2A and then in the arrow direction shown in Fig. 2B, by the magnetic attraction and repellent forces exerted between the electromagnet and the permanent magnets attached to the rod.

The rod vibrates at the power supply(60Hz/50Hz)frequency and changes the volume of the space enclosed between the head(casing) and the diaphragm. Thus, air intake, compression, and exhaust, can be performed as the rod vibrates.

Fig. 2A

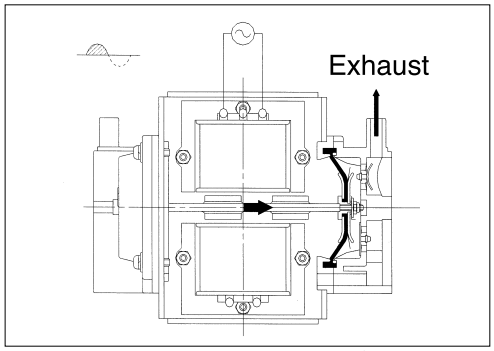
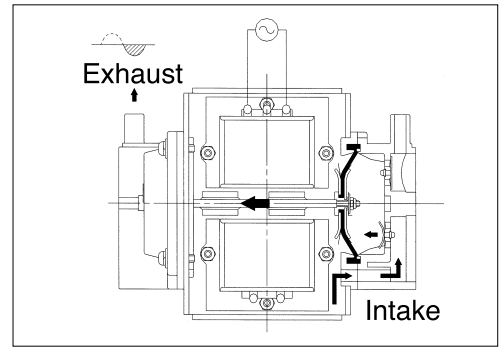


Fig. 2B



MAINTENANCE

⚠ **WARNING:** Always disconnect power before installing or servicing. Failure to do so could result in electrical shock, personal injury or death. The motor may be thermally protected and will automatically restart when it cools, if the thermal protection switch is tripped.

⚠ **CAUTION:** The filters must be periodically cleaned or replaced. A clogged filter can cause overheating or pump failure.

Any servicing of the unit other than that recommended in the instruction manual must be performed by an Authorized Service Facility. Inspection of filters is suggested every three months.
When inspecting filter, also clean inlet port area of filter and housing. Filters can be cleaned with soap and water. Be sure to dry all parts and filter well before reinstalling. If the pump makes an abnormal noise, or the amount of discharged air is greatly decreased, turn off the power immediately.

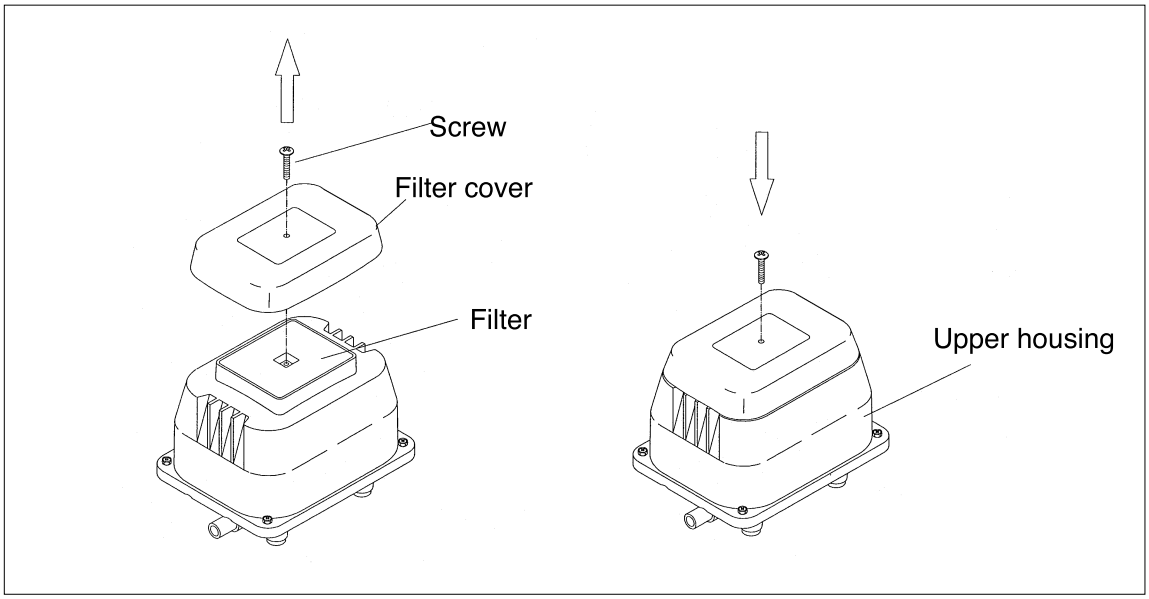
For repairs or replacement parts, please contact the factory, or send unit to an Authorized Service Facility.

Cleaning the filter (Refer to Fig.3)

REPLACEMENT FILTERPAD PART#	
HP-40	40PA000010
HP-60/HP-80	80PA000040
HP-100/HP-100LL/HP-120/HP-120LL/HP-150/HP-200	120PA20010

- Undo the truss screw securing the cover to the pump housing, and remove the Filter pad.
- Gently dust the Filter pad then hand-wash in mild soapy water and be sure to dry well before reinstalling
- Replace the Filter pad and cover. Secure with the truss screw.

Fig. 3



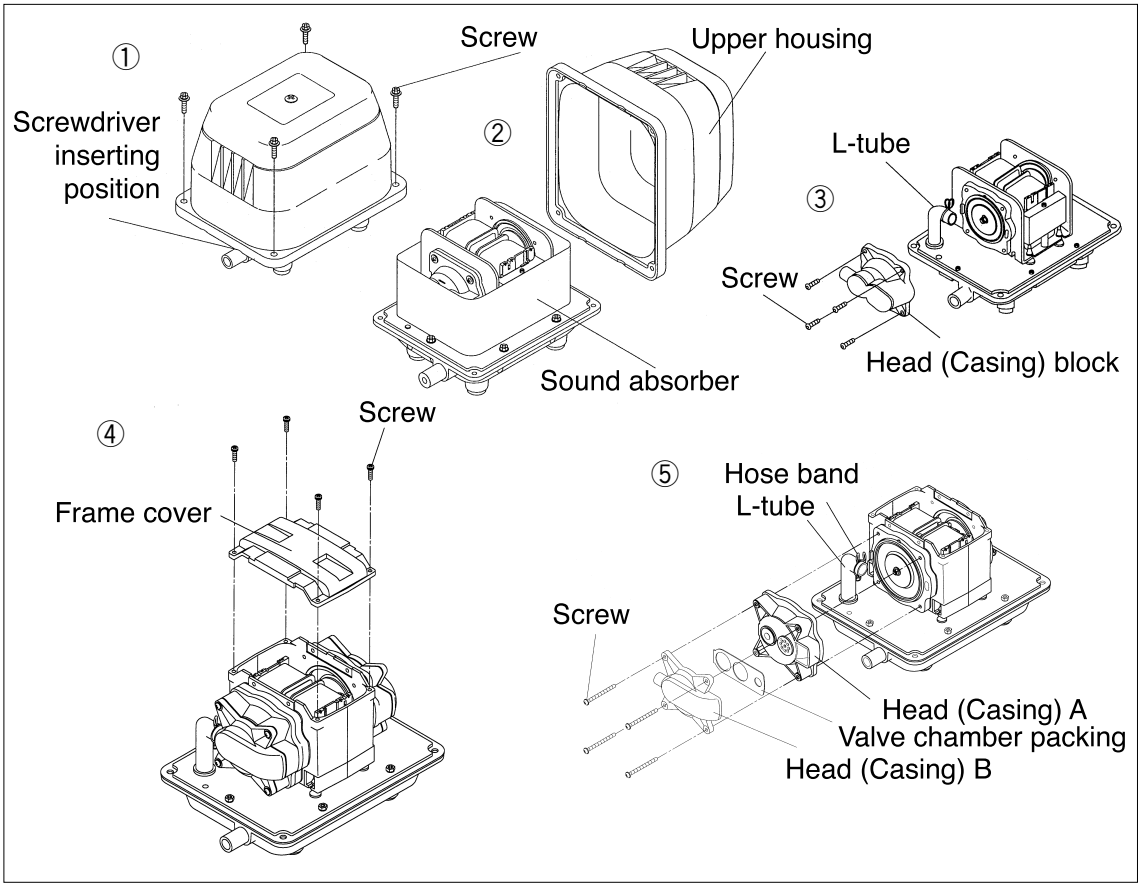
Changing the Pump (Chamber) Assembly-HP Series

REPLACEMENT PUMP ASSEMBLY PART#		CONTENTS
HP-40	40PC000030	Head (Casing) block
HP-60/HP-80	80PC000041	Diaphragm mounting block
HP-100/HP-120	120PC20011	Hex nut (U-lock nut) / washer
HP-100LL/HP-120LL	120PC20021	Safety screw / plastic nut (HP-60 and over)
HP-150/HP-200	200PC20011	

〔1〕 Remove the Head (Casing) block (Refer to Fig.4)

- Remove the four corner screws(Refer to Fig.4-①), and the Upper housing. (Refer to Fig.4-②) If stuck, insert screwdriver between exhaust outlet and Upper housing, and gently pry apart.
- Remove the Sound absorber. (Refer to Fig.4-②, except for HP-40, HP-100LL, HP-120LL)
- Remove the screws from all the corners of Frame cover for subsequent removal of the Frame cover. (For HP-100/120, Refer to Fig.4-④)
- Undo the hose band and remove the L-tube from the Head (Casing) block.
- Remove screws attaching the Head (Casing) to the pump mechanism, and remove Head (Casing) block. (Refer to Fig.4-③. For HP-100/120, Refer to Fig.4-⑤)

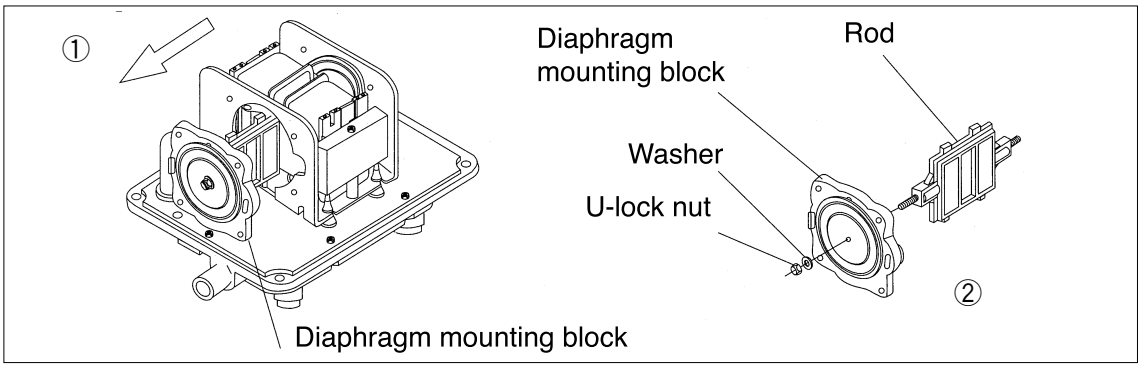
Fig. 4



〔2〕 **Replacing Diaphragm mounting block** (Refer to Fig.5)

- After removing Head (Casing) block, remove one of the hex nut (U-lock nut) and washer in the center of the diaphragm.
- Remove one of the Diaphragm mounting blocks from the Rod, and pull out the other Diaphragm mounting block from the pump body together with the Rod without loosening its hex nut (U-lock nut) and washer. (Refer to Fig.5-①)
- Then remove the other Diaphragm mounting block from the Rod. (Refer to Fig.5-②)
- Reattach a new Diaphragm mounting block on one side of the Rod with new hex nut (U-lock nut) and washer, insert the Rod in accordance with the procedure reverse to that performed when the Rod was removed the pump.
- Reattach washer and new hex nut (U-lock nut) to Rod screw protruding through other Diaphragm mounting block and tighten.

Fig. 5



Operation of Compressor Alarm Module

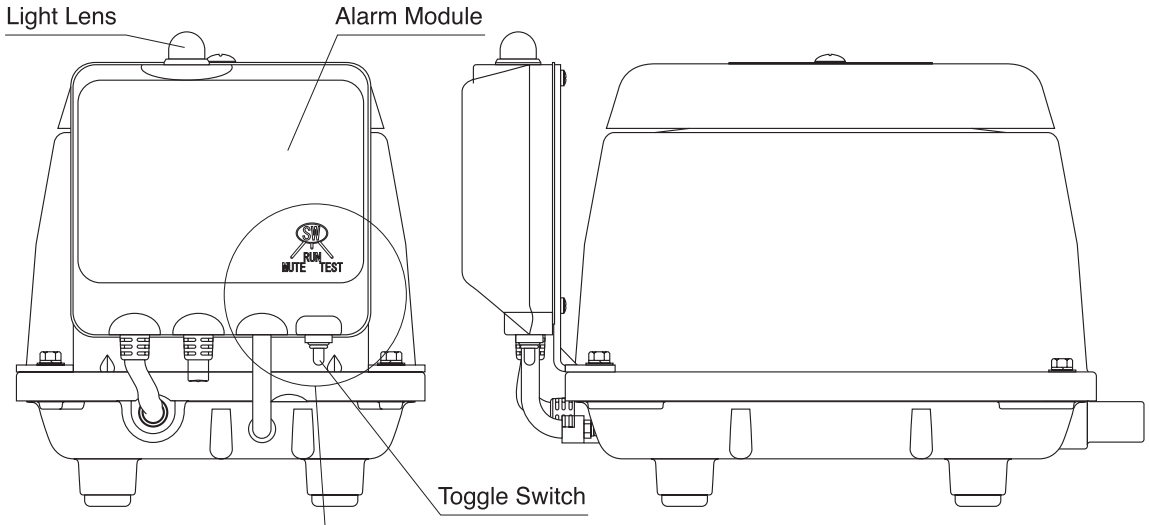
General Information

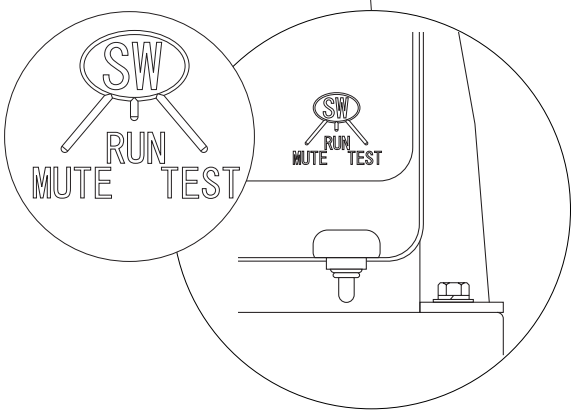
⚠ **Danger:** Do not attempt to open the alarm module. If the unit is connected to electricity, opening of the alarm module can result in a risk of electric shock.

⚠ **Danger:** Service of the alarm module should only be done by a qualified electrician or serviceman.

⚠ **Danger:** If the outside of the alarm module or light lens becomes cracked or damaged, unplug or shut-off the electric power immediately and contact an electrician or serviceman.

⚠ **Caution:** Do not carry the unit by the alarm module or electrical cord. It could damage the alarm module.





The three position toggle switch is clearly labeled on the alarm module.

RUN : During normal operation the switch is in the "RUN" or center position.

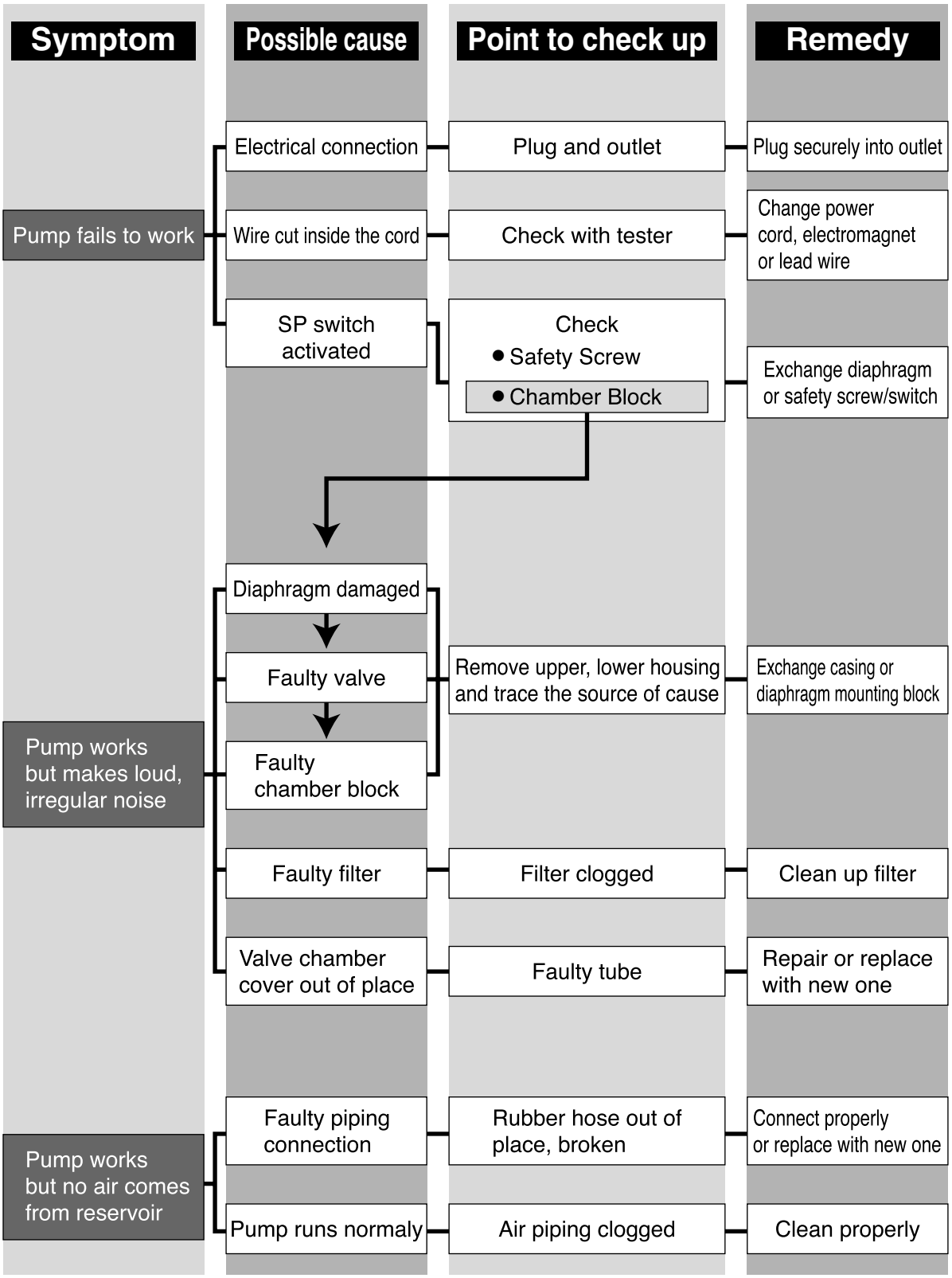
MUTE : The "MUTE" position will silence the audible alarm while leaving the visual alarm operational.

TEST : The "TEST" position will activate both the audible and visual alarms to check to see if they are working.

In Case of an Alarm :

The alarm module audible alarm (buzzer) and visual alarm (light) are intended to signal a system malfunction. Contact your service provider whenever you hear or see the alarm when the switch is in the "RUN" or center position. The "MUTE" position can be used to silence the audible alarm until the service provider arrives.

TROUBLE SHOOTING



YOUR WARRANTY

Hiblow products, when properly installed and operated under normal conditions of use, are warranted by Hiblow to be free from defects in material and workmanship for a period of twelve (12) months from the date of purchase from Hiblow. In order to obtain performance under this warranty, the buyer must give written notice within thirty (30) days after discovery of the defect to Hiblow USA, Inc., 1300 Tefft Court Suite 8, Saline Michigan USA 48176. Buyer is responsible for freight charges both to and from Hiblow in all cases.

Hiblow's warranties do not extend to any goods or parts which have been subjected to misuse, lack of maintenance, neglect, damage by accident or transit damage.

This warranty excludes all other warranties or representations expressed or implied by any literature, data or person. Hiblow's maximum liability under this exclusive remedy shall never exceed the cost of the subject product and Hiblow reserves the right, at its sole discretion, to refund the purchase price in lieu of repair or replacement.

Hiblow will not be responsible or liable for indirect or consequential damages of any kind, however arising, including but not limited to those for use of any products, loss of time, inconvenience, lost profit, labor charges, or other incidental or consequential damages with respect to persons, business or property, whether as a result of breach of warranty, negligence or otherwise.

Buyer's remedy against Hiblow for goods supplied or for non-delivered goods or failure to furnish goods, whether or not based on negligence, strict liability or breach of expressed or implied warranty is limited solely, at Hiblow's option, to replacement of or cure of such nonconforming goods or non delivered goods or return of the purchase price for such goods and in no event shall exceed the price or charge for such goods. Hiblow expressly disclaims any warranty or merchantability or fitness for a particular use or purpose with respect to goods sold. There are no warranties which extend beyond the descriptions set forth in this warranty, notwithstanding any knowledge of Hiblow regarding the use or uses intended to be made of goods, proposed changes or additions to goods, or any assistance or suggestions that may have been made by Hiblow personnel.

Unauthorized extensions of warranties by the customer shall remain the customer's responsibility.

Customer is responsible for determining the suitability of Hiblow products for customer's use or resale or for incorporating them into objects or applications which customer designs, assembles, constructs or manufactures.

This warranty can be modified only by authorized Hiblow personnel by signing a specific, written description of any modifications.

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Operating Instructions

INTERMATIC®
Providing a brighter solution.™

FM/1 Series
Time Switches

TECHNICAL DATA

Supply Voltage:	24, 120 and 240VAC, 60Hz models Quartz: 24V AC/DC, 120 and 240VAC 50/60 Hz
Switch Type:	SPDT
Switch Rating:	21A/250VAC resistive 1350 watt tungsten 1HP @ 125VAC 2HP @ 240VAC
Power Consumption:	**24V:** 0.1VA; **120V:** 0.5VA; **240V:** 1.0VA
Ambient Temp. Range:	–40°F to 180°F, synchronous units –20°F to 140°F, quartz units
Terminals:	1/4" spade terminals
Reserve Carryover:	7 days for quartz units
Weight:	Approximately 3 oz.

NOTE: 24V quartz unit will operate on 6VDC, 12VDC, or 24VDC

APPLICATIONS

The FM/1 series of time switches are designed for control of heating, ventilating, air conditioning, refrigeration, lighting, security, circulating pumps, spas or any electrical load requiring 24-hour or 7-day scheduling.

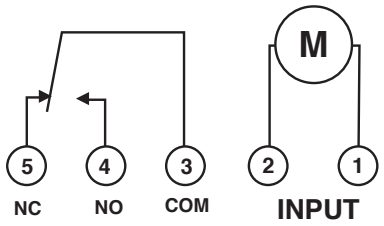
WIRING

Verify input voltage stated on back of unit. Use 1/4" quick connects and make connections in accordance with the wiring diagram shown and applicable code requirements. When using 24V units, it is important to use transformers that will supply the required 24 volts AC to terminals 1 & 2.

Terminal Connections

Contacts shown in "Off" position (trippers pushed inward)

"On" position (trippers pushed outward) will close contacts 3 & 4

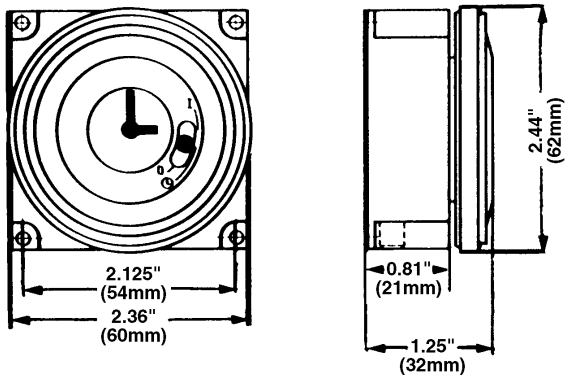


MOUNTING

The standard FM/1 units can be flush mounted (mounting kit with screws available) or surface mounted inside a panel. A printed circuit board mounting base is also available. An indoor or outdoor enclosure is available for stand-alone mounting. In addition, unit is also available in DIN housing for flush or surface mounting (see MIL72, Digi 20 or Digi 42 data sheets). Optional clear plastic dust cover is available.

Dimensions

FM/1 synchronous/quartz



TIME SETTING

TO SET THE CURRENT TIME (AND DAY OF WEEK ON 7 DAY UNITS), TURN THE MINUTE HAND CLOCKWISE. DO NOT SET THE TIME BY ROTATING "OUTER" DIAL.

Turn the minute hand clockwise until the day of the week (7-day timer) and the time of day on the outer dial is aligned with the triangle marker on the inner dial (two o'clock position).

Example for 7-day program dial Monday 10:30 AM. Turn the minute hand clockwise until Monday 10:30 AM is aligned with the triangle on the inner dial. The hour and minute hand will show exactly 10:30.

Example for 24-hour program dial 10:30 AM. Turn the minute hand clockwise until 10:30 AM is aligned with the triangle on the inner dial. The hour and the minute dial will show exactly 10:30.

PROGRAMMING

7-Day (SW, QRW Models)

The weekly program dial reflects the seven days of the week and AM/PM imprints for each day.

The time switch is programmed by pushing the captive trippers to the outer ring position for the entire period that the load is to be turned "ON", i.e., two hours for each tripper on the 7-Day dial. When the tripper is pushed to the inside, the switch is in the "OFF" position.

24-Hour (ST, QRT Models)

The 24-Hour dial has quarter-hour divisions and AM/PM indications.

The time switch is programmed by pushing the captive trippers to the outer ring position for the entire period that the load is to be turned "ON", i.e., fifteen minutes for each tripper on the 24-Hour dial. When the tripper is pushed to the inside, the switch is in the "OFF" position.

PROGRAMMING WITH MANUAL OVERRIDE SWITCH

AUTOMATIC MODE

In order to operate the time switch module in the automatic mode, the manual switch must be in the center position (automatic) - see diagram.

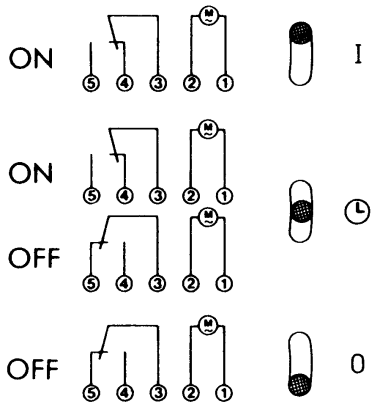
MANUAL MODE

With the manual switch selector lever the selected programs can be overridden. In the lower position, marked "O", terminals 3 and 5 are permanently closed. In the upper position, marked "I", terminals 3 and 4 are permanently closed (see diagram).

Override Mode

3-way manual override switch

I = permanent ON
◷ = automatic
0 = permanent OFF



FM/1 Series

24 Hour, 7 Day

APPLICATION: The FM/1 series electromechanical timer modules are designed to be placed inside a machine control panel, circuit board, or other equipment. It offers up to 21A switching designed for control of heating, ventilating, air conditioning, refrigeration, lighting, security, circulating pumps, spas or any electrical load requiring 24-hour or 7-day scheduling.

Specifications:

Size: 2.36" x 2.36" x 1.25"
Supply Voltage: 24, 120, 240VAC
Power Consumption: 1 VA
Switch Rating: SPDT
Resistive: 21A
Tungsten: 1350W
Inductive: 1HP @ 120VAC
2HP @ 240VAC
Wiring Connections: 1/4" quick-connects
Installation: Stand Alone: With indoor or outdoor enclosure
Panel: Surface mounting

Features:

- 21A SPDT switch
- Captive Trippers
- 1/4" quick terminals
- Noise Immune—Ideal for robust applications

FM/1 Series Ordering Data†

Grasslin Model	Intermatic Model	Override	Switch Program	Carryover	Program On/Off Every	Minimum On/Off Time	Switch Output Type	Switch Output Rating
FM/1 STuZ-120	FM1STUZ-120U	No	24 Hr.	No	15 Minutes	15 Minutes	SPDT	21A. Res.
FM/1 STuZ-24	FM1STUZ-24U	No	24 Hr.	No	15 Minutes	15 Minutes	SPDT	21A. Res.
FM/1 STuZ-240	FM1STUZ-240U	No	24 Hr.	No	15 Minutes	15 Minutes	SPDT	21A. Res.
FM/1 SWuZ-120	FM1SWUZ-120U	No	7 day	No	2 Hours	2 Hours	SPDT	21A. Res.
FM/1 SWuZ-24	FM1SWUZ-24U	No	7 day	No	2 Hours	2 Hours	SPDT	21A. Res.
FM/1 SWuZ-240	FM1SWUZ-240U	No	7 day	No	2 Hours	2 Hours	SPDT	21A. Res.
FM/1 STuZH-120	FM1STUZH-120U	Yes	24 Hr.	No	15 Minutes	15 Minutes	SPDT	21A. Res.
FM/1 STuZH-24	FM1STUZH-24U	Yes	24 Hr.	No	15 Minutes	15 Minutes	SPDT	21A. Res.
FM/1 STuZH-240	FM1STUZH-240U	Yes	24 Hr.	No	15 Minutes	15 Minutes	SPDT	21A. Res.
FM/1 SWuZH-120	FM1SWUZH-120U	Yes	7 day	No	2 Hours	2 Hours	SPDT	21A. Res.
FM/1 SWuZH-24	FM1SWUZH-24U	Yes	7 day	No	2 Hours	2 Hours	SPDT	21A. Res.
FM/1 SWuZH-240	FM1SWUZH-240U	Yes	7 day	No	2 Hours	2 Hours	SPDT	21A. Res.
FM/1 SWuZH-277	FM1SWUZH-277U	Yes	7 day	No	2 Hours	2 Hours	SPDT	21A. Res.
FM/1 QTuZH-120	FM1QTUZH-120U	Yes	24 Hr.	7 day	15 Minutes	15 Minutes	SPDT	21A. Res.
FM/1 QTuZH-24	FM1QTUZH-24U	Yes	24 Hr.	7 day	15 Minutes	15 Minutes	SPDT	21A. Res.
FM/1 QWuZH-120	FM1QWUZH-120U	Yes	7 day	2 Hr.	2 Hours	2 Hours	SPDT	21A. Res.
FM/1 QWuZH-240	FM1QWUZH-240U	Yes	7 day	2 Hr.	2 Hours	2 Hours	SPDT	21A. Res.

Available with 24V, 120V, 240V, 277VAC input

Solid-state Twin Timers

H3CR-F

DIN 48 × 48-mm Twin Timers

- Wide power supply ranges of 100 to 240 VAC and 48 to 125 VDC respectively.
- ON- and OFF-times can be set independently and so combinations of long ON- or OFF-time and short OFF- or ON-time settings are possible.
- Fourteen time ranges from 0.05 s to 30 h or from 1.2 s to 300 h depending on the model to be used.
- Models with a flicker ON start or flicker OFF start are available.
- Easy sequence checks through instantaneous outputs for a zero set value at any time range.
- Length, when panel-mounted with a Socket, of 80 mm or less.
- 11-pin and 8-pin models are available.

Model Number Structure

■ Model Number Legend

H3CR - F □ □ - □ □
1 2 3 4 5

1. Classification
F: Twin timers

2. Configuration
None: 11-pin socket
8: 8-pin socket

3. Twin Timer Mode
None: Flicker OFF start
N: Flicker ON start

4. Time Range
None: 0.05 s to 30 h models
300: 1.2 s to 300 h models

5. Supply Voltage
100-240AC: 100 to 240 VAC
24AC/DC: 24 VAC/VDC
12DC: 12 VDC
48-125DC: 48 to 125 VDC

Ordering Information

■ List of Models

Operating modes	Supply voltage	0.05 s to 30 h models		1.2 s to 300 h models	
		11-pin models	8-pin models	11-pin models	8-pin models
Flicker OFF start	100 to 240 VAC	H3CR-F 100-240AC	H3CR-F8 100-240AC	H3CR-F-300 100-240AC	H3CR-F8-300 100-240AC
	24 VAC/DC	H3CR-F 24AC/DC	H3CR-F8 24AC/DC	H3CR-F-300 24AC/DC	H3CR-F8-300 24AC/DC
	12 VDC	H3CR-F 12DC	H3CR-F8 12DC	H3CR-F-300 12DC	H3CR-F8-300 12DC
	48 to 125 VDC	H3CR-F 48-125DC	H3CR-F8 48-125DC	H3CR-F-300 48-125DC	H3CR-F8-300 48-125DC
Flicker ON start	100 to 240 VAC	H3CR-FN 100-240AC	H3CR-F8N 100-240AC	H3CR-FN-300 100-240AC	H3CR-F8N-300 100-240AC
	24 VAC/DC	H3CR-FN 24AC/DC	H3CR-F8N 24AC/DC	H3CR-FN-300 24AC/DC	H3CR-F8N-300 24AC/DC
	12 VDC	H3CR-FN 12DC	H3CR-F8N 12DC	H3CR-FN-300 12DC	H3CR-F8N-300 12DC
	48 to 125 VDC	H3CR-FN 48-125DC	H3CR-F8N 48-125DC	H3CR-FN-300 48-125DC	H3CR-F8N-300 48-125DC

Note: Specify both the model number and supply voltage when ordering.
Example: H3CR-F 100-240AC
Supply voltage

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■ Accessories (Order Separately)

Name/specifications		Models
Flush Mounting Adapter		Y92F-30
		Y92F-73
		Y92F-74
Mounting Track	**50 cm (ℓ) × 7.3 mm (t)**	PFP-50N
	1 m (ℓ) × 7.3 mm (t)	PFP-100N
	1 m (ℓ) × 16 mm (t)	PFP-100N2
End Plate		PFP-M
Spacer		PFP-S
Protective Cover		Y92A-48B
Track Mounting/ Front Connecting Socket	**8-pin**	P2CF-08
	8-pin, finger safe type	P2CF-08-E
	11-pin	P2CF-11
	11-pin, finger safe type	P2CF-11-E
Back Connecting Socket	**8-pin**	P3G-08
	8-pin, finger safe type	P3G-08 with Y92A-48G (See note 1)
	11-pin	P3GA-11
	11-pin, finger safe type	P3GA-11 with Y92A-48G (See note 1)
Hold-down Clip (See note 2)	**For PL08 and PL11 Sockets**	Y92H-7
	For PF085A Socket	Y92H-8

Note: 1. Y92A-48G is a finger safe terminal cover which is attached to the P3G-08 or P3GA-11 Socket.
2. Hold-down Clips are sold in sets of two.

Specifications

■ General

Item	H3CR-F	H3CR-F8	H3CR-FN	H3CR-F8N
Operating mode	Flicker OFF start		Flicker ON start	
Pin type	11-pin	8-pin	11-pin	8-pin
Operating/Reset method	Time-limit operation/Time-limit reset or self-reset			
Output type	Relay output (DPDT)			
Mounting method	DIN track mounting, surface mounting, and flush mounting			
Approved standards	UL508, CSA C22.2 No.14, NK, Lloyds Conforms to EN61812-1 and IEC60664-1 (VDE0110) 4kV/2. Output category according to EN60947-5-1.			

■ Time Ranges

0.05 s to 30 h Models

Time unit		s (sec)	×10 s (10 sec)	min (min)	h (hrs)
Setting	1.2	0.05 to 1.2	1.2 to 12	0.12 to 1.2	
	3	0.3 to 3	3 to 30	0.3 to 3	
	12	1.2 to 12	12 to 120	1.2 to 12	
	30	3 to 30	30 to 300	3 to 30	

Note: Instantaneous output is available at any time range. To obtain instantaneous output, set to below 0.

1.2 s to 300 h Models

Time unit		×10 s (10 sec)	×10 min (10 min)	h (hrs)	×10 h (10 hrs)
Setting	1.2	1.2 to 12	1.2 to 12	0.12 to 1.2	1.2 to 12
	3	3 to 30	3 to 30	0.3 to 3	3 to 30
	12	12 to 120	12 to 120	1.2 to 12	12 to 120
	30	30 to 300	30 to 300	3 to 30	30 to 300

Note: Instantaneous output is available at any time range. To obtain instantaneous output, set to below 0.

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■ Ratings

Rated supply voltage (See notes 1, 2, and 3.)	100 to 240 VAC (50/60 Hz),12 VDC, 24 VAC/DC (50/60 Hz), 48 to 125 VDC
Operating voltage range	85% to 110% of rated supply voltage; 90% to 110% with 12-VDC models
Power reset	Minimum power-opening time: 0.1 s
Power consumption	100 to 240 VAC: approx. 10 VA (2.1 W) at 240 VAC 24 VAC/VDC: approx. 2 VA (1.7 W) at 24 VAC approx. 1 W at 24 VDC 48 to 125 VDC: approx. 1.5 W at 125 VDC 12 VDC: approx. 1 W at 12 VDC
Control outputs	Contact output: 5 A at 250 VAC/30 VDC, resistive load ($\cos\phi = 1$)

Note: 1. A power supply with a ripple of 20% max. (single-phase power supply with full-wave rectification) can be used with each DC Model.

2. Do not use an inverter output as the power supply. Refer to *Safety Precautions for All Timers* for details.

3. Refer to *Safety Precautions for All Timers* when using the Timer together with a 2-wire AC proximity sensor.

■ Characteristics

Accuracy of operating time	±0.2% FS max. (±0.2% FS ±10 ms max. in ranges of 1.2 and 3 s)		
Setting error	±5% FS ±50 ms max.		
Reset time	0.1 s max.		
Reset voltage	10% max. of rated voltage		
Influence of voltage	±0.2% FS max. (±0.2% FS ±10 ms max. in ranges of 1.2 and 3 s)		
Influence of temperature	±1% FS max. (±1% FS ±10 ms max. in ranges of 1.2 and 3s)		
Insulation resistance	100 MΩ min. (at 500 VDC)		
Dielectric strength	2,000 VAC, 50/60 Hz for 1 min (between current-carrying metal parts and exposed non-current-carrying metal parts) 2,000 VAC, 50/60 Hz for 1 min (between control output terminals and operating circuit) 2,000 VAC, 50/60 Hz for 1 min (between contacts of different polarities) 1,000 VAC, 50/60 Hz for 1 min (between contacts not located next to each other)		
Impulse withstand voltage	3 kV (between power terminals) for 100 to 240 VAC, 48 to 125 VDC 1 kV for 12 VDC, 24 VAC/DC 4.5 kV (between current-carrying terminal and exposed non-current-carrying metal parts) for 100 to 240 VAC, 48 to 125 VDC 1.5 kV for 12 VDC, 24 VAC/DC		
Noise immunity	±1.5 kV (between power terminals), square-wave noise by noise simulator (pulse width: 100 ns/1 μs, 1-ns rise) ±400 V for 12 VDC		
Static immunity	Malfunction: 8 kV Destruction: 15 kV		
Vibration resistance	Destruction: 10 to 55 Hz with 0.75-mm single amplitude for 2 hrs each in three directions Malfunction: 10 to 55 Hz with 0.5-mm single amplitude for 10 min each in three directions		
Shock resistance	Destruction: 980 m/s^2 three times each in six directions Malfunction: 98 m/s^2 three times each in six directions		
Ambient temperature	Operating: −10°C to 55°C (with no icing) Storage: −25°C to 65°C (with no icing)		
Ambient humidity	Operating: 35% to 85%		
Life expectancy	Mechanical: 20 million operations min. (under no load at 1,800 operations/h) Electrical: 100,000 operations min. (5 A at 250 VAC, resistive load at 1,800 operations/h) (See note)		
EMC	(EMI)	EN61812-1	
	Emission Enclosure:	EN55011 Group 1 class A	
	Emission AC Mains:	EN55011 Group 1 class A	
	(EMS)	EN61812-1	
	Immunity ESD:	IEC61000-4-2:	6 kV contact discharge (level 3) 8 kV air discharge (level 3)
	Immunity RF-interference from AM Radio Waves:		IEC61000-4-3: 10 V/m (80 MHz to 1 GHz) (level 3)
	Immunity RF-interference from Pulse-modulated Radio Waves:		IEC61000-4-3: 10 V/m (900±5 MHz) (level 3)
	Immunity Conducted Disturbance:	IEC61000-4-6:	10 V (0.15 to 80 MHz) (level 3)
	Immunity Burst:	IEC61000-4-4:	2 kV power-line (level 3) 2 kV I/O signal-line (level 4)
	Immunity Surge:	IEC61000-4-5:	1 kV line to line (level 3) 2 kV line to ground (level 3)
Case color	Light Gray (Munsell 5Y7/1)		
Degree of protection	IP40 (panel surface)		
Weight	Approx. 100 g		

Note: Refer to the *Life-test Curve*.

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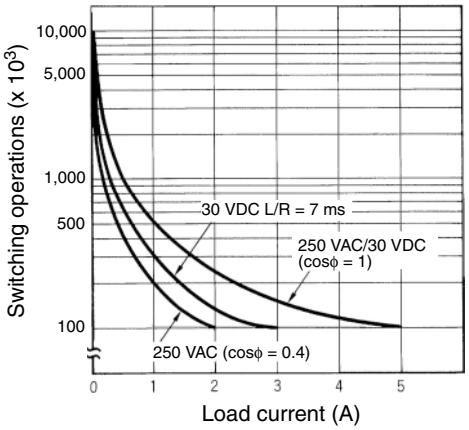
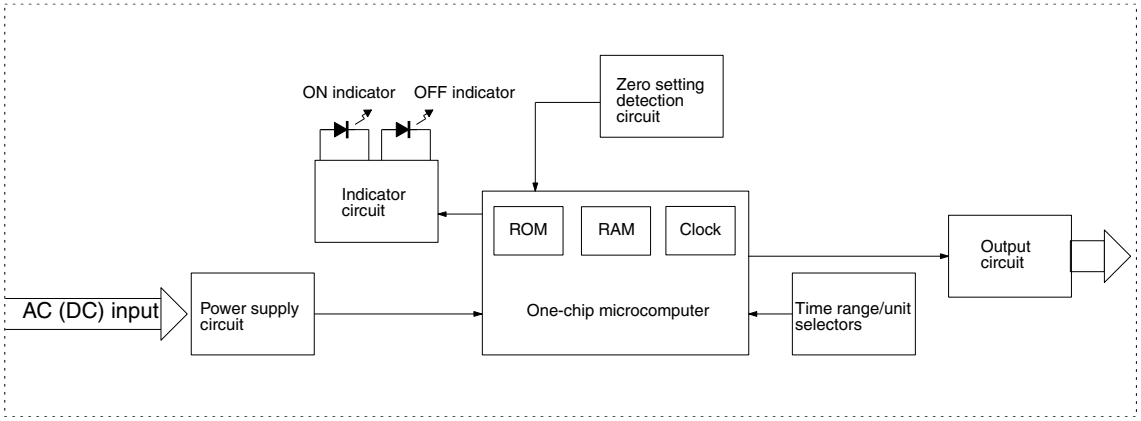
■ Life-test Curve



Reference: A maximum current of 0.15 A can be switched at 125 VDC (cosϕ = 1) and a maximum current of 0.1 A can be switched if L/R is 7 ms. In both cases, a life of 100,000 operations can be expected.
The minimum applicable load is 10 mA at 5 VDC (failure level: P).

Connections

■ Block Diagrams

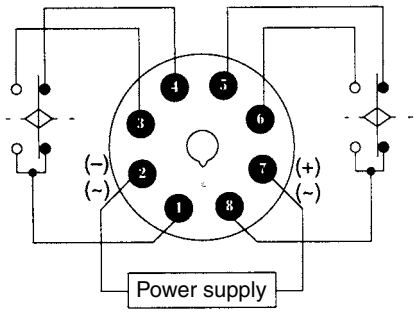


■ I/O Functions

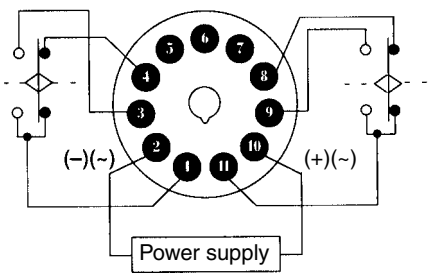
Inputs		---
Outputs	**Control output**	Outputs are turned ON/OFF according to the time set by the ON- and OFF-time setting knob.

■ Terminal Arrangement

H3CR-F8
H3CR-F8
NH3CR-F8-300
H3CR-F8N-300



H3CR-F
H3CR-FN
H3CR-F-300
H3CR-FN-300



Note: Leave terminals 5, 6, and 7 open.
Do not use them as relay terminals.

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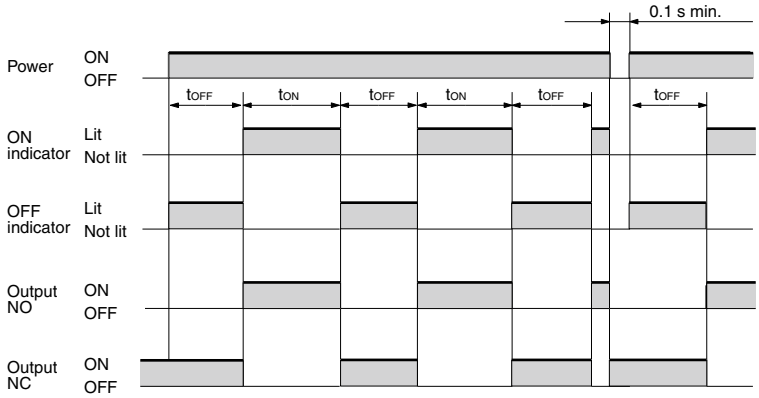
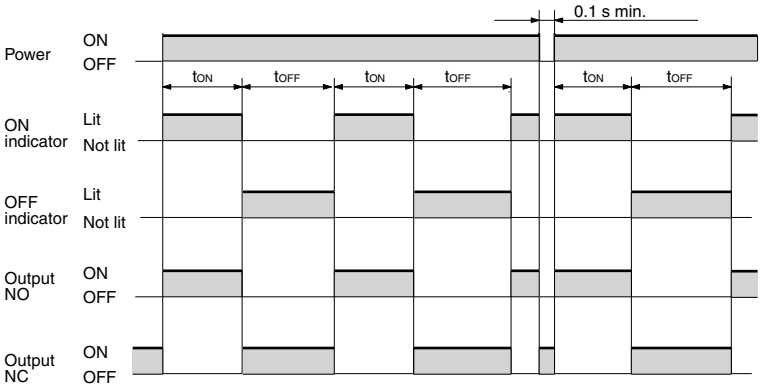
Operation

■ Timing Chart

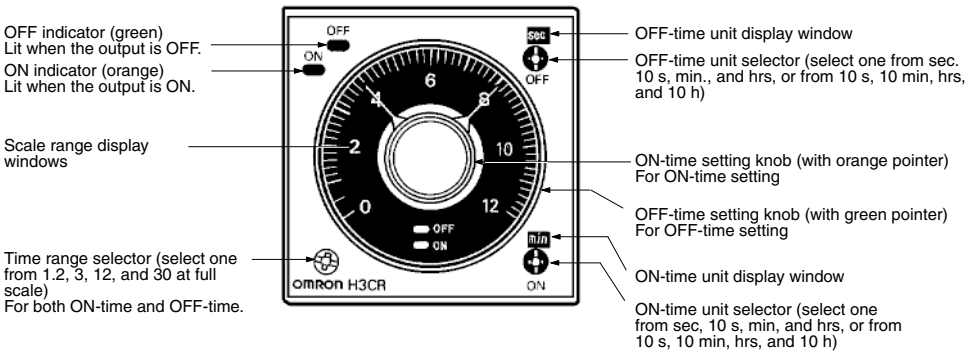
t_{ON}: ON set time
t_{OFF}: OFF set time

Operating mode	Timing chart
Flicker OFF start	
Flicker ON start	

Note: 1. The reset time requires a minimum of 0.1 s.

2. When power is supplied in flicker ON start mode, the OFF indicator lights momentarily. This, however, has no effect on the performance of the Timer.

Nomenclature


OFF indicator (green)
Lit when the output is OFF.
ON indicator (orange)
Lit when the output is ON.
Scale range display windows
Time range selector (select one from 1.2, 3, 12, and 30 at full scale)
For both ON-time and OFF-time.
OFF-time unit display window
OFF-time unit selector (select one from sec. 10 s, min., and hrs, or from 10 s, 10 min, hrs, and 10 h)
ON-time setting knob (with orange pointer)
For ON-time setting
OFF-time setting knob (with green pointer)
For OFF-time setting
ON-time unit display window
ON-time unit selector (select one from sec, 10 s, min, and hrs, or from 10 s, 10 min, hrs, and 10 h)
OMRON H3CR

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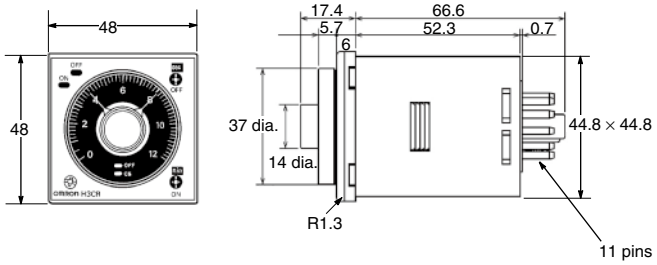
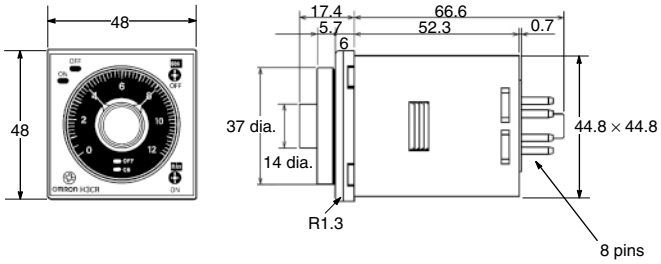
Dimensions

Note: All units are in millimeters unless otherwise indicated.

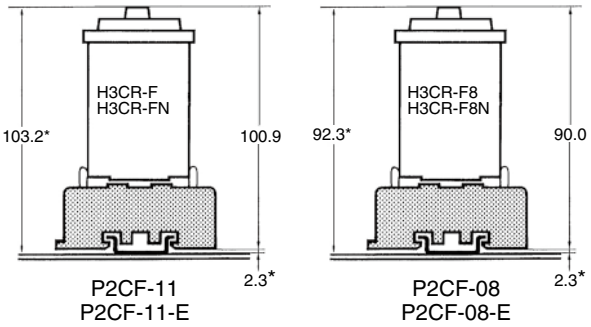
H3CR-F
H3CR-FN
H3CR-F-300
H3CR-FN-300



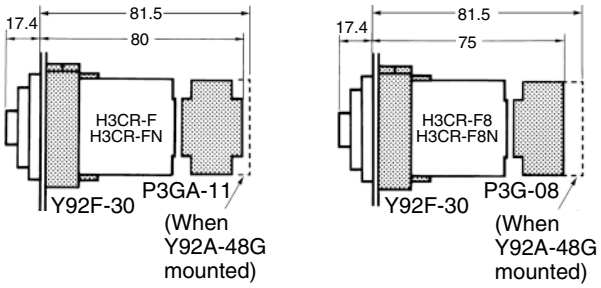
H3CR-F8
H3CR-F8N
H3CR-F8-300
H3CR-F8N-300



Dimensions with Front Connecting Socket
P2CF-08-□/P2CF-11-□



Dimensions with Back Connecting Socket
P3G-08/P3GA-11



*These dimensions vary with the kind of DIN track (reference value).

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

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Safety Precautions for All Timers

Refer to the *Safety Precautions* for individual Timers for precautions specific to each Timer.

⚠ WARNING

The following Timers contain lithium batteries that are not explosion proof.

1. Timers with Built-in Batteries: H5L
   The Timer contains a lithium battery, which may occasionally ignite or rupture. Do not disassemble, deform under pressure, heat to 100°C or higher, or incinerate the Timer.
2. Timers with Replaceable Batteries: Y92S-20 (for H5CN-M)
   The battery may occasionally rupture, ignite, or leak fluid. Do not short the positive and negative terminals. Do not charge, disassemble, deform under pressure, or throw the battery into a fire. If a non-specified battery is used, the battery may leak fluid or rupture, occasionally resulting in equipment failure or minor injury. Use only the specified battery.

⚠ CAUTION

The following Timers contain lithium batteries that are explosion proof.

Timers with Built-in Batteries: H5BR, H5AN-4DM, H5S, H5F, and H4KV

The Timer contains a lithium battery, which may occasionally ignite or rupture. Do not disassemble, deform under pressure, heat to 100°C or higher, or incinerate the Timer.

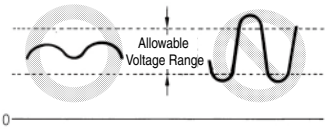
■ Precautions for Safe Use

Operating Environment

- Use the Timer within the ratings specified for ambient operating temperature and ambient operating humidity for each model.
- Store the Timer with the specified temperature range for each model. If the Timer has been stored at a temperature of less than −10°C, allow the Timer to stand at room temperature for at least 3 hours before using it.
- Use the Timer within the performance specified for water and oil exposure for each model.
- Do not use the Timer in locations subject to shock and vibration. Long-term usage in such locations may damage the Timer due to stress.
  Magnetic contactors generate a shock of 1,000 to 2,000 m/s^2 when switching a load. When mounting to DIN Track, separate magnetic contactors from the Timer so that the Timer is not subjected to vibration and shock. Use anti-vibration rubber.
- Do not use the Timer in locations subject to excessive dust, corrosive gases, or direct sunlight.
- Do not use organic solvents (such as paint thinner or benzine), strong alkalis, or strong acids because they will damage the external finish of the Timer.
- Separate the input devices, input wiring, and Timer as far as possible from sources of noise and power lines carrying noise.
- When using the Timer in environments subject to large amounts of static electricity (e.g., pipes carrying molding materials, powders, or fluid materials), separate the Timer as far as possible from the sources of static electricity.
- Do not remove the external case from the Timer.
- Do not use the Timer in locations where condensation may occur due to high humidity or sudden temperature changes. Condensation inside the Timer may result in malfunction or damage to Timer elements.
- The life of internal parts may be reduced if Timers are mounted in close proximity to each other.
- Resin and rubber parts (e.g., rubber packing) may deteriorate, shrink, or harden depending on the operating environment (e.g., subjected to corrosive gases, ultraviolet light, or high temperatures). We recommend periodic inspection and replacement.
- Normal operation may not be possible in locations subject to sulfidizing gas, such as in sewer systems or waste incinerators. OMRON does not market any Timers or other control devices for operation in atmospheres containing sulfidizing gas. Seal the Timer so that sulfidizing gas will not enter it. If sealing is not possible, OMRON does provide special Timers with improved resistance to sulfidizing gas. Ask your OMRON representative for details.

Power Supply

- Be sure that the voltage applied is within the specified range, otherwise the internal elements of the Timer may be damaged.
- Install a switch or circuit breaker that allows the operator to immediately turn OFF the power, and label it to clearly indicate its function.
- Maintain voltage fluctuations in the power supply within the specified range.



- Use a commercial power supply for the power supply voltage input to models with AC inputs.
  Inverters with an output frequency of 50/60 Hz are available, but the rise in the internal temperature of the Timer may result in ignition or burning. Do not use an inverter output for the power supply of the Timer.
- The Timers listed below cannot be directly turned ON and OFF by using an AC 2-wire proximity sensor to turn the Timer's power supply ON and OFF.
  Use the following countermeasure when using an AC 2-wire proximity sensor with the Timer. (The power supply circuit in the Timer uses half-wave rectification. Only a half AC wave is supplied to the proximity sensor, which may cause operation to be unstable.)

  Applicable Models

  H3Y, H3YN, H3RN, H3CA-8, RD2P, and H3CR(-A, -A8, -AP, -F, and -G)

  Countermeasure

  Wire through a relay and use the relay contacts to turn the power supply ON and OFF.

  Confirm the stability of operation after making the connections.
- Install protective measures (such as earth leakage breakers, wiring breakers, or fuses) on the power supply side according to any applicable laws or regulations.

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Correctly Handling Input Signals

Malfunction due to noise may occur if input wiring is placed in the same duct or conduit as power lines or high-voltage lines. Separate input wiring from power lines and wire them in a separate system. Also, use shielded cables, use metal conduits, and keep wiring distances as short as possible.

Timers with Relays

- Do not connect a load that exceeds contact ratings, such as the switching capacity (contact voltage or contact current). Insulation faults, contact welding, contact faults, and other failures to achieve specified performance may occur and the relay may be damaged or may burn.
- Continued use with deteriorated performance may ultimately result in insulation breakdown between circuits or relay burning. The life of the built-in relay is greatly affected by switching conditions. Before using the Timer, test operation under actual application conditions and confirm that the switching frequency presents no problems in performance.
- Electrical life depends on the type of load, switching frequency, and ambient environment. Observe the following precautions when using the Timer. When switching a DC load, contact transfer may cause the contacts to stick or may cause contact failure. Confirm applicability and consider using a surge absorbing element. When switching at high frequencies, heat generated by arcing may cause contacts to melt or may cause metal corrosion. Consider connecting an arc absorbing element, reducing the switching frequency, or lowering the humidity.
- The surge current depends on the type of load, which also affects contact switching frequency and the number of operations. Check the rated current and the surge current, and design the circuits with sufficient margin.

Resistive load	Solenoid load	Motor load	Incandescent lamp load
Rated current	10 to 20 times the rated current	5 to 10 times the rated current	10 to 20 times the rated current

Sodium light loads	Capacitor loads	Transformer loads	Mercury light loads
1 to 3 times the rated load	20 to 40 times the rated load	5 to 15 times the rated load	1 to 3 times the rated load

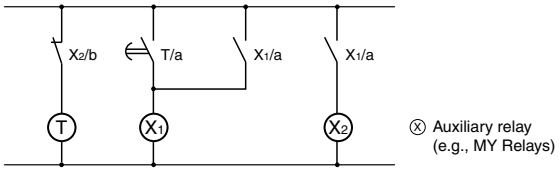
- Arcing when switching and relay heating may result in ignition or explosion. Do not use the Timer in atmospheres subject to inflammable or explosive gases.
- Contact faults may occur. Do not use the Timer in atmospheres subject to sulfidizing gas, chloride gas, or silicon gas.
- The switching capacity for DC voltage loads is lower than that for AC voltage loads.

Timers with Non-contact Outputs

- Short faults or open faults may occur due to destruction of the output element. Do not use the Timer for a load that exceeds the rated output current.
- Short faults or open faults may occur due to destruction of the output element from reverse electromotive force. When using the Timer for a DC inductive load, always connect a diode as a countermeasure against reverse electromotive force.

Other Precautions

- Confirm that you have the correct model before using it.
- Be sure that all terminals are wired correctly.
- Always test the output status with a tester before using a Timer with a built-in keep relay (e.g., the H3CR-H and H3DE-H). Shock resulting from dropping the Timer during transport or handling may cause the output contacts to reverse or to be in a neutral status.
- Leaving the Timer with outputs ON at a high temperature for a long time may hasten the degradation of internal parts (such as electrolytic capacitors). Use the Timer in combination with relays and avoid leaving the Timer with the output turned ON for an extended period of time (e.g., for more than a month).
  Reference Example (Use the Timer as shown below.)



- Be sure that only a qualified worker (e.g., an electrical engineer) performs electrical work for the Timer.

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- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

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Appendix 4: Electrical Controls Schematics

Rhombus Panels: Used prior to ’08 (No longer use nor have parts available)

Model 11 Electrical Controls Schematics.....EC-11 / CP-11

Model 20 Electrical Controls Schematics.....EC-20 / CP-20

Model 30 Electrical Controls Schematics.....EC-30 / CP-30

Model 32 Electrical Controls Schematics.....EC-32 / CP-32

SPI Panels: Used ’08 to Present

Model 11 Electrical Controls Schematics.....EC-11 / CP-11

Model 20 Electrical Controls Schematics.....EC-20 / CP-20

Model 30 Electrical Controls Schematics.....EC-30 / CP-30

Model 32 Electrical Controls Schematics.....EC-32 / CP-32

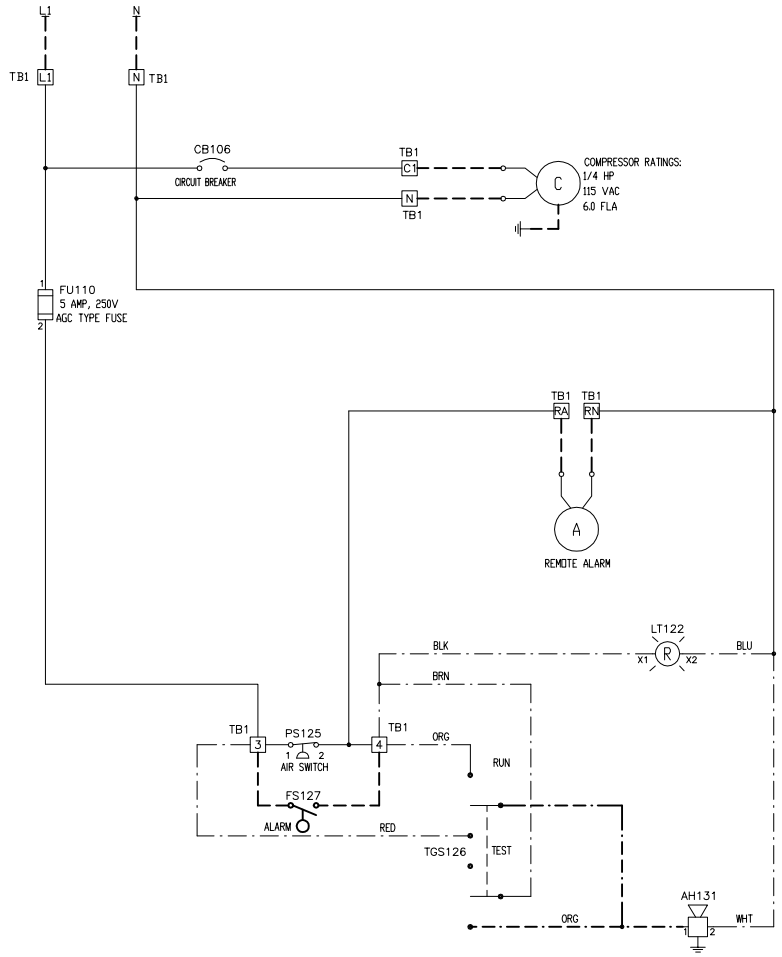
OEC Panels: Used ’09 to Present

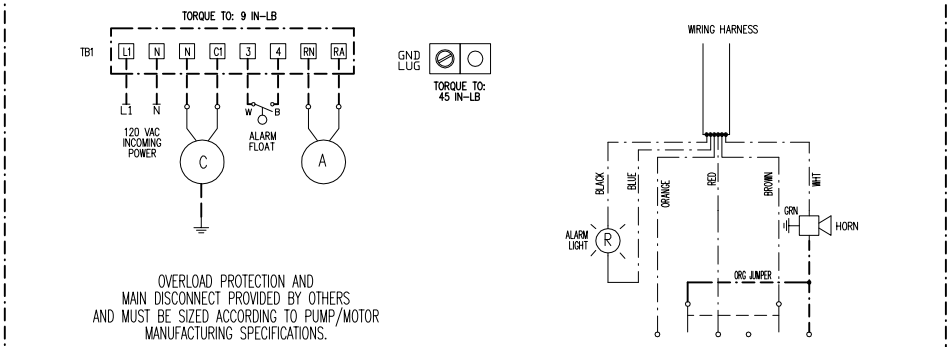
Model 11 Electrical Controls Schematics.....EC-11 / CP-11

Model 20 Electrical Controls Schematics.....EC-20 / CP-20

Model 30 Electrical Controls Schematics.....EC-30 / CP-30

Model 32 Electrical Controls Schematics.....EC-32 / CP-32





ENCL	BP	PKG	H/T CBL
LIT	LBLS	X-TRA	G-LUG

1

REV	ECO NO.	DATE	DRWN	APPD

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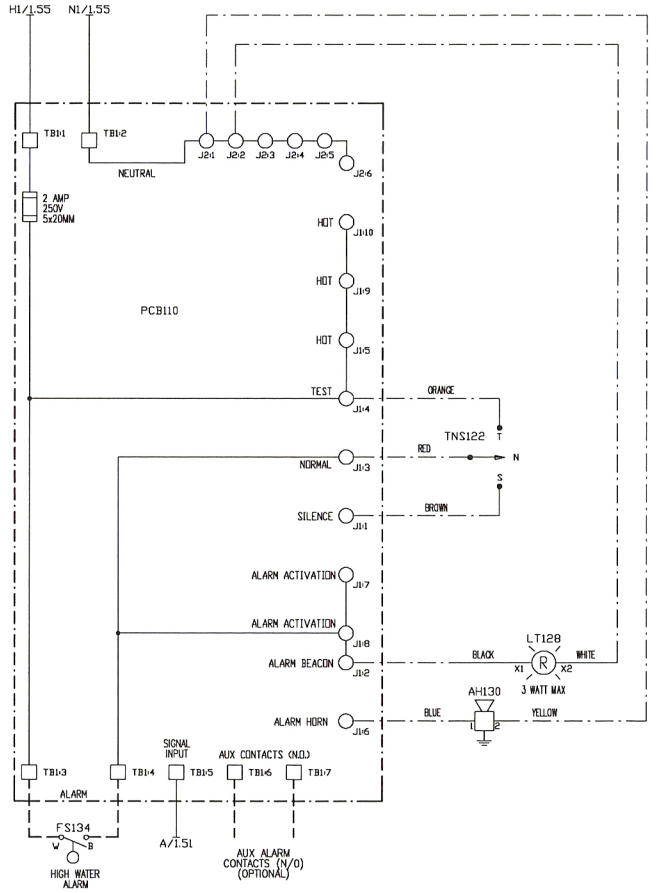
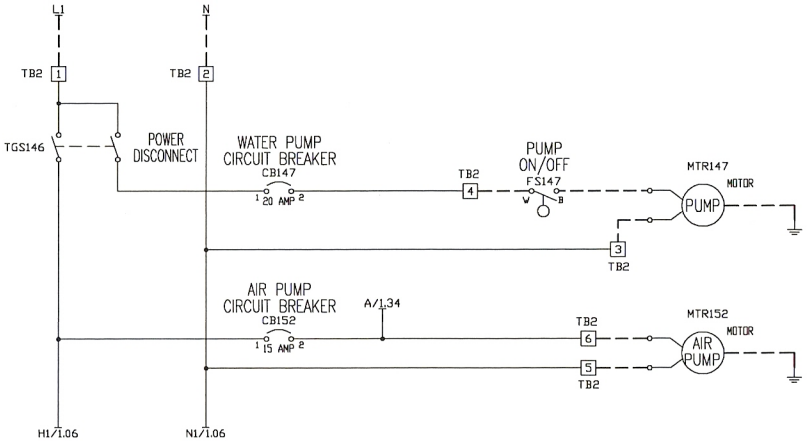
SJE-Rhombus

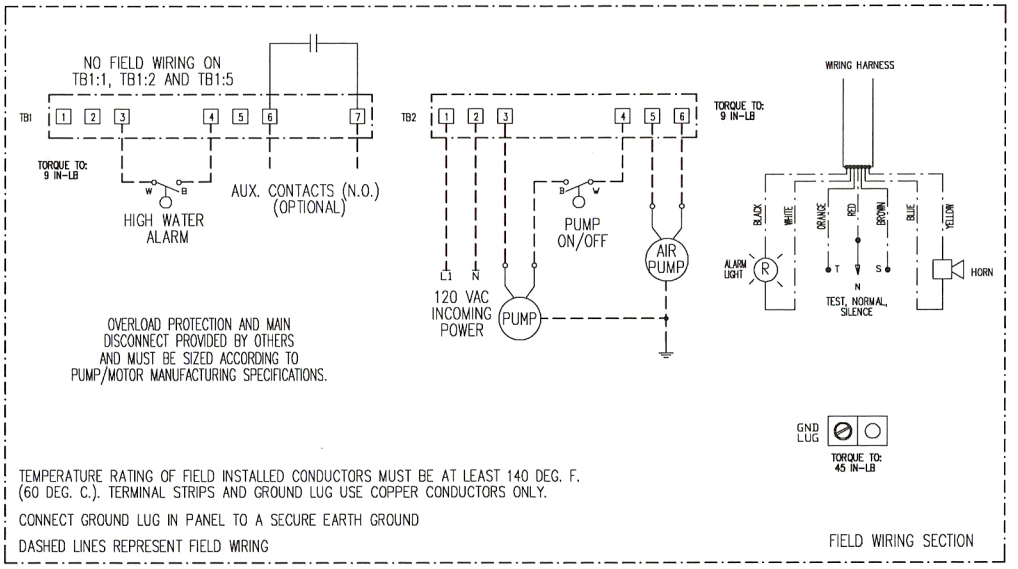
DRWN BY	DATE	CHKD BY	DATE	APPD BY	DATE	PROJECT NO.	QUOTE NO.	REV.
GDV	05/20/08	GDV	05/20/08	DPM	05/23/08	P9552	N/A	A

OEM NAME	OEM P/N	PAGE	SCALE	DWG SIZE	TITLE
SPI/BIO	N/A	1 of 1	NONE	D	EC-11/CP-11

REV. CNTRL FOR: 100663







REV. CNTRL DOC. 1008457	REV	ECO NO.	DATE	DRWN	APPD
	E	C002853	03/06	GDV	RMS
	D	C001714	6/03	GDV	KLC
	C	C000981	8/01	GDV	RMS
	B	C000697	1/01	GDV	RMS
	A	C99206	7/99	CRM	

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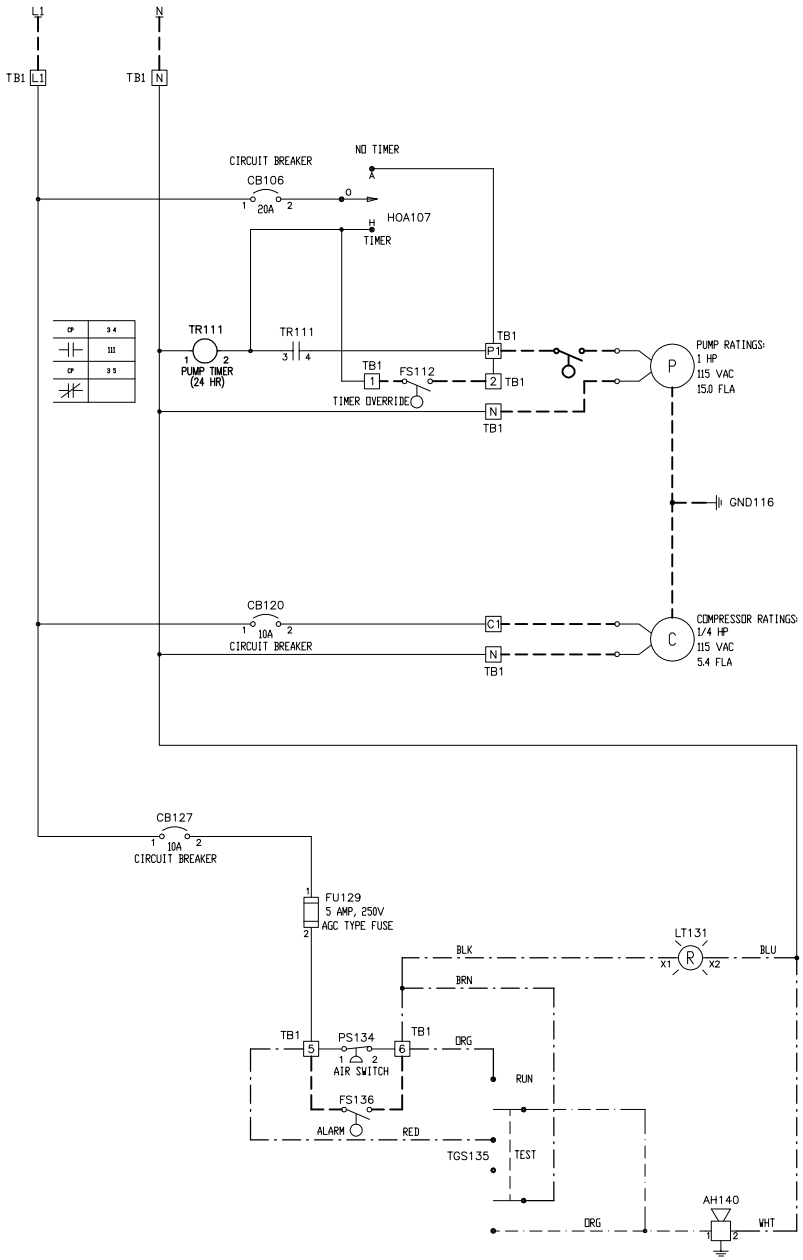
DRWN BY	DATE	CHKD BY	DATE	APPD BY	DATE
CRM	7/28/99	RMS	7/28/99	MRO	7/28/99

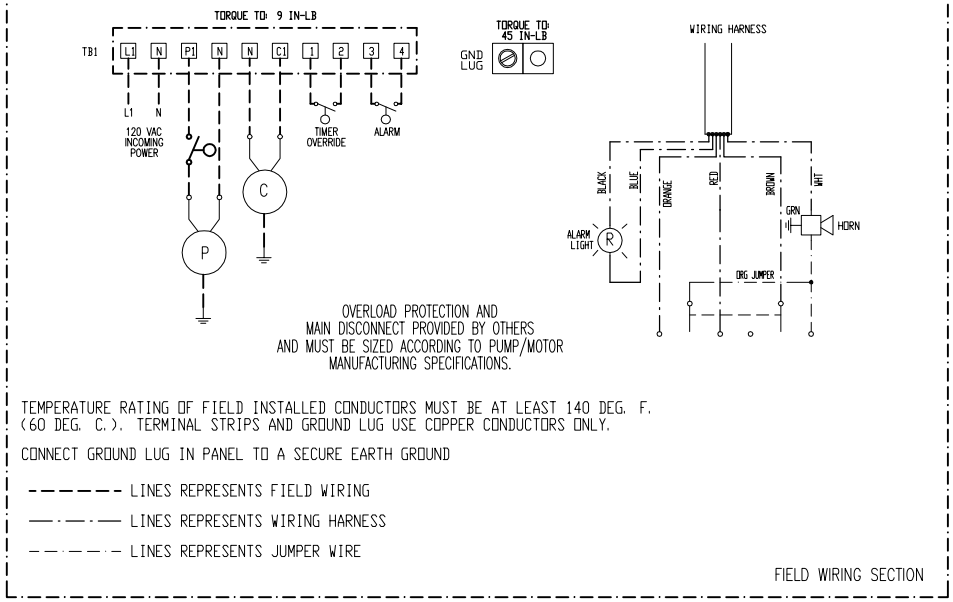
OEM NAME	OEM P/N	PAGE	SCALE	DWG SIZE
HYDRO-ACTION	EC MODEL #20	1 of 1	NONE	D

SJE-Rhombus CONTROLS

PROJECT NO.	QUOTE NO.	REV.
1008473	N/A	E

TITLE: LIT, HYDN, SCHEM EC MODEL #20 W/CON. & HARNESS





ENCL	BP	PKG	H/T CBL
LIT	LBLS	X-TRAG-LUG	

2

REV	ECO NO.	DATE	DRWN	APPD

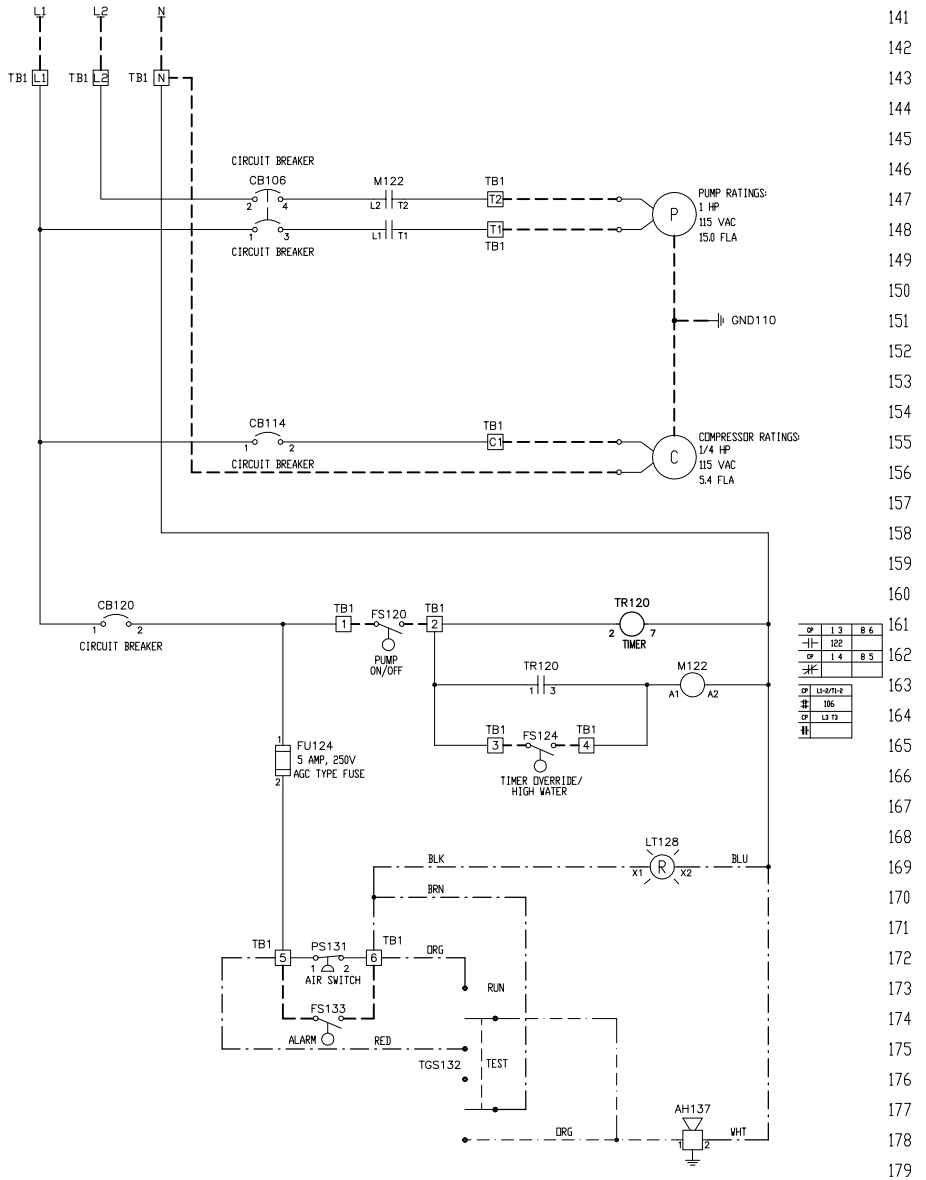
NOTICE: THIS DRAWING CONTAINS PROPRIETARY INFORMATION AND IT SHALL NOT BE USED OR REPRODUCED OR ITS CONTENTS DISCLOSED IN WHOLE OR IN PART, WITHOUT PRIOR WRITTEN CONSENT.

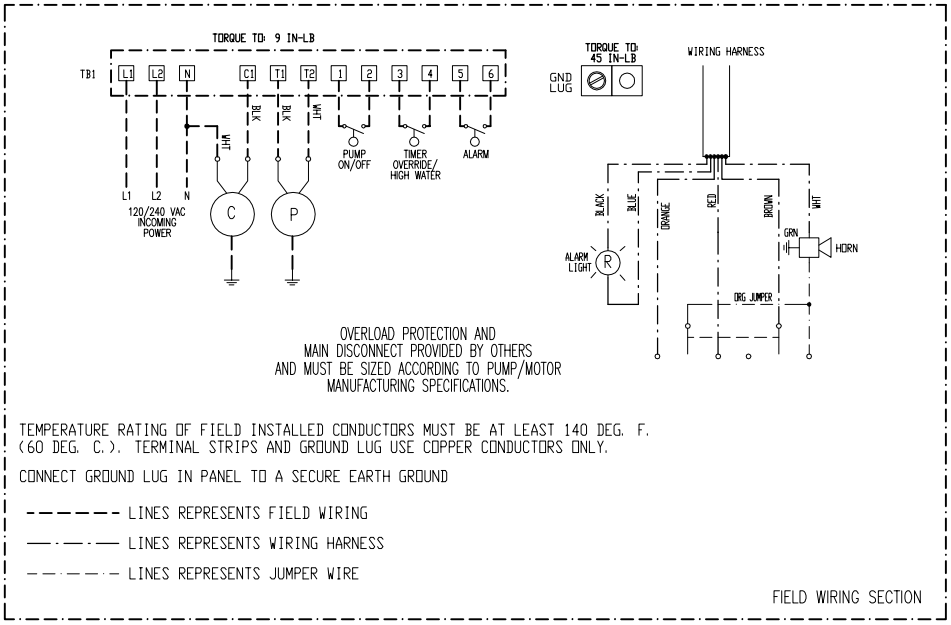
SJE-Rhombus

DRWN BY DATE	CHKD BY DATE	APPD BY DATE	PROJECT NO.	QUOTE NO.	REV.
GDV 05/19/08	GDV 05/19/08	DPM 05/23/08	P9550	DCC874	A

OEM NAME	OEM P/N	PAGE	SCALE	DWG SIZE	TITLE
SPI/BIO	N/A	1 of 1	NONE	D	CP-30A/EC-30A

REV. CNTRL DOC R22.2.46





ENCL	BP	PKG	H/T CBL
LIT	LBLS	X-TRAG-LUG	

NOTICE: THIS DRAWING CONTAINS PROPIETARY INFORMATION AND IT SHALL NOT BE USED OR REPRODUCED OR ITS CONTENTS DISCLOSED IN WHOLE OR IN PART, WITHOUT PRIOR WRITTEN CONSENT.

SJE-Rhombus

DRWN BY	DATE	CHKD BY	DATE	APPD BY	DATE	PROJECT NO.	QUOTE NO.	REV.
GDV	05/20/08	GDV	05/20/08	DPM	09/09/08	P9551	DCC874	A

REV	ECO NO.	DATE	DRWN	APPD	OEM NAME	OEM P/N	PAGE	SCALE	DWG SIZE	TITLE
					SPI/BIO	N/A	1 of 1	NONE	D	CP-32A2/EC-32A2

REV. CNTRL DOC. R22.2.4A

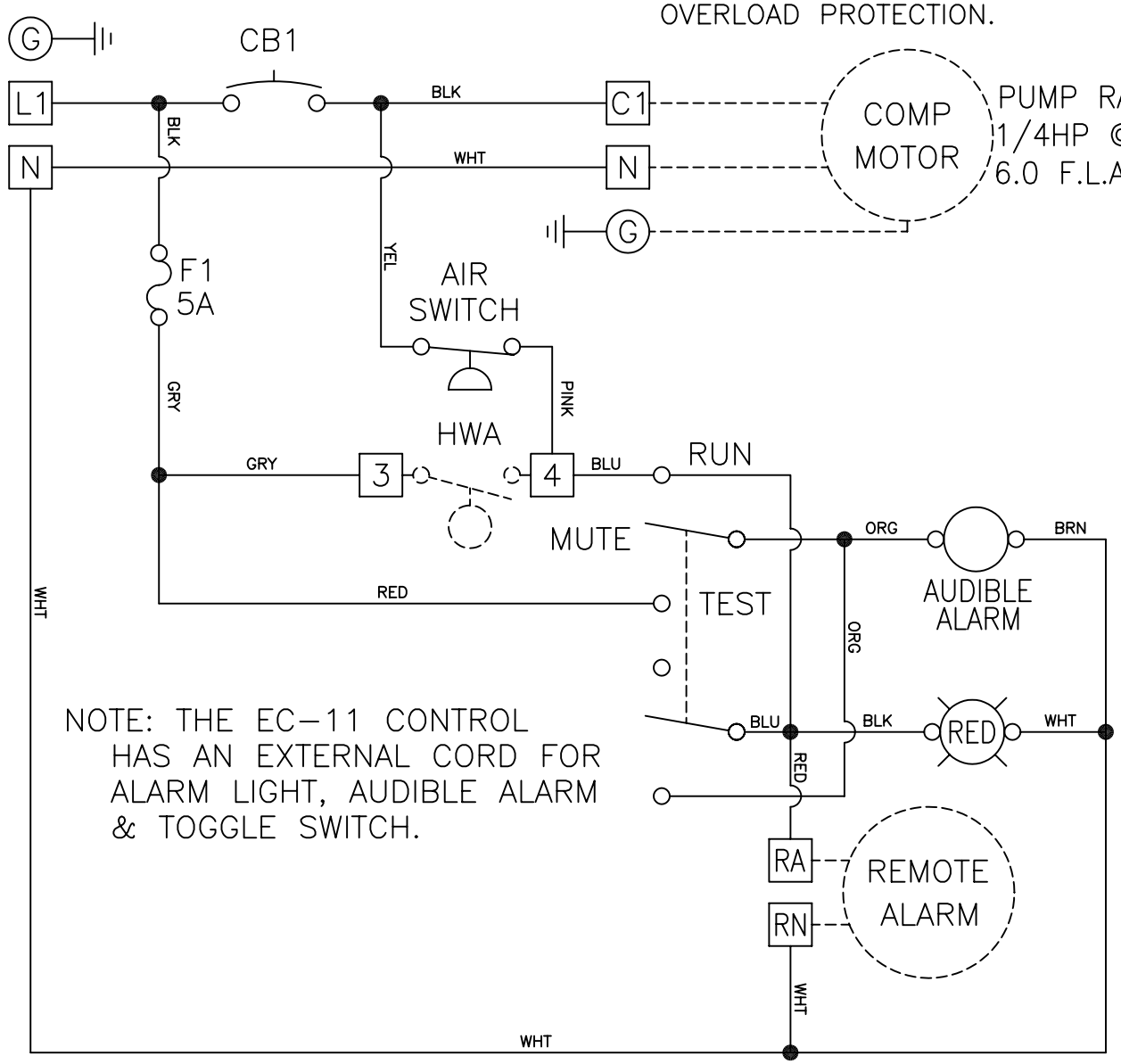
2

50B126

PAGE 1

PUMP POWER CIRCUIT
115V – 1PH

NOTE: MOTOR MUST HAVE INTERNAL OVERLOAD PROTECTION.



NOTE: THE EC–11 CONTROL HAS AN EXTERNAL CORD FOR ALARM LIGHT, AUDIBLE ALARM & TOGGLE SWITCH.

NOTES: MAIN PANEL DISCONNECT MUST BE PROVIDED BY INSTALLER.
DASHED LINES INDICATE ITEMS NOT CONTAINED IN THE PANEL.
FIELD WIRING MUST BE A MINIMUM OF 60°C COPPER WIRE.
REQUIRED TORQUE FOR TERMINAL BLOCK SCREWS IS 9 in–lbs.

ALL INFORMATION CONTAINED IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY TO SEPTIC PRODUCTS, INC.

SPI|BIO
Wastewater Technologies

CHANGES		TOLERANCES	DRAWN BY	DATE
F		DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	06/20/05
E			MATERIAL SPECIFICATION: AS NOTED	
D				
C				
B				
A				

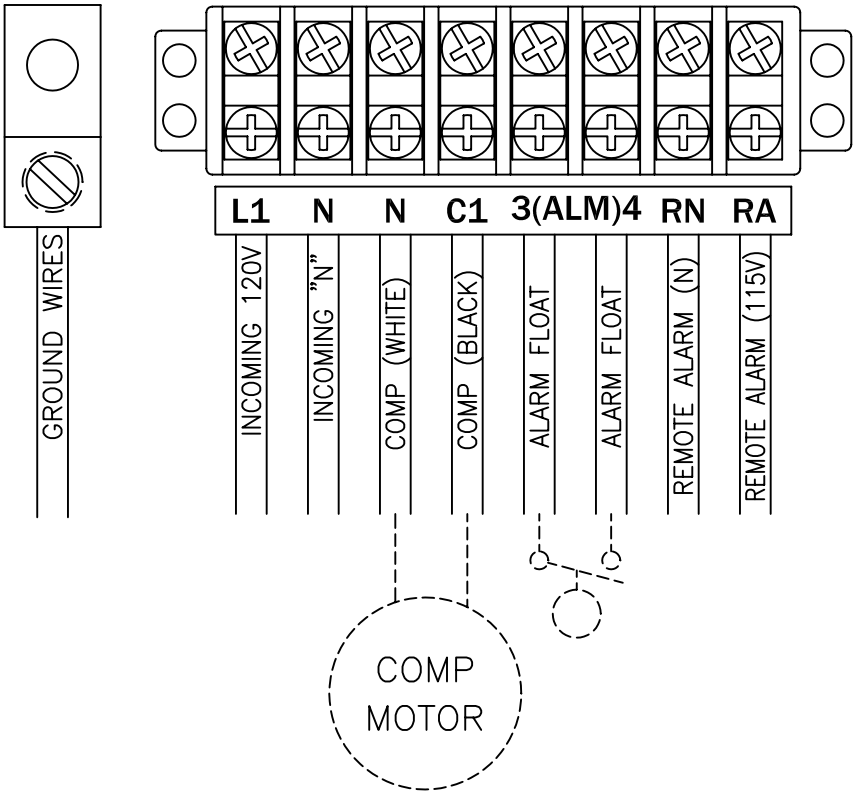
SCHEMATIC, ELECTRICAL
COMP ALARM W/HWA

SCALE:	PART NO.
FULL	EC–11/CP–11

TIGHTENING TORQUE FOR TERMINAL BLOCK IS 9 in–lbs.

HYDRO–ACTION

CONNECTION DIAGRAM EC-11 & CP-11 ALARM PANEL



ALL INFORMATION CONTAINED IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY TO SEPTIC PRODUCTS INC.

SPI/BIO Wastewater Technologies

CHANGES		TOLERANCES	DRAWN BY	DATE
F		DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	5/20/04
E			MATERIAL SPECIFICATION: AS NOTED	
D				
C				
B				
A				

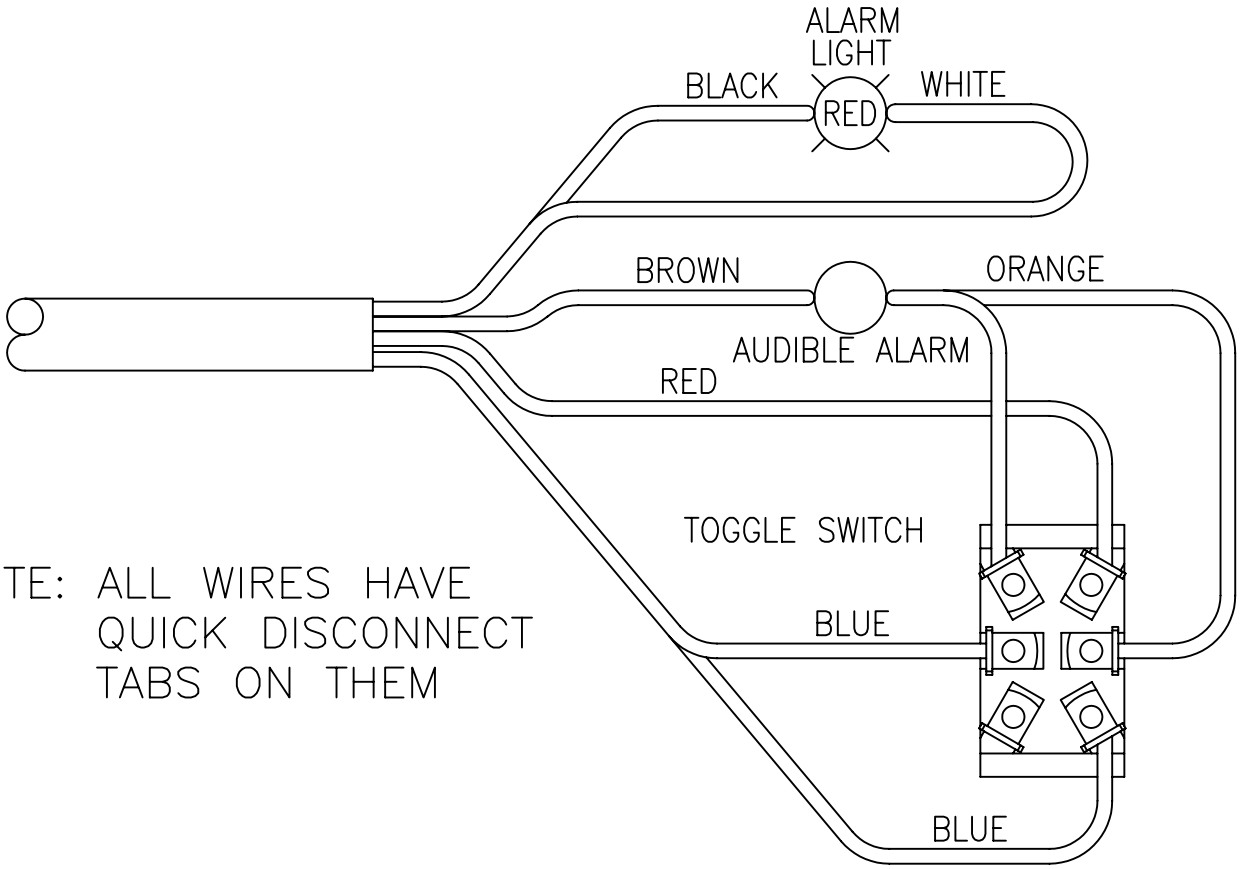
POWER CONNECTION DIAGRAM

SCALE:	PART NO.
FULL	EC–11/CP–11

TIGHTENING TORQUE FOR TERMINAL BLOCK IS 9 in–lbs.

HYDRO–ACTION

CONNECTION DIAGRAM EC-11 EXTERNAL COMPONENTS



NOTE: ALL WIRES HAVE QUICK DISCONNECT TABS ON THEM

ALL INFORMATION CONTAINED IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY TO SEPTIC PRODUCTS INC.

SPI/BIO
Wastewater Technologies

CHANGES	TOLERANCES	DRAWN BY	DATE
F	DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	5/20/04
E		MATERIAL SPECIFICATION: AS NOTED	
D			
C			
B			
A			

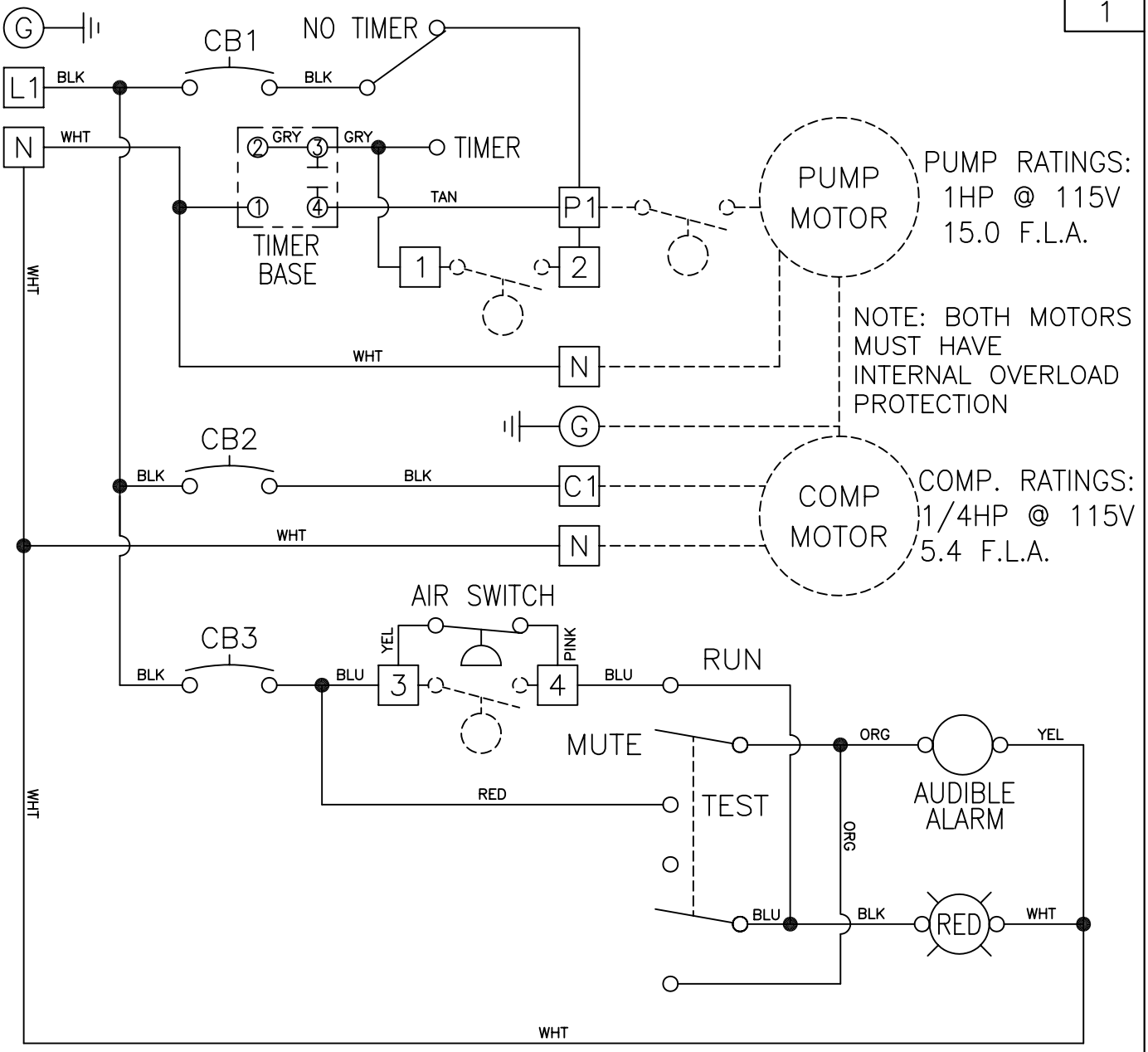
POWER CONNECTION DIAGRAM

SCALE:	PART NO.
FULL	EC–11/CP–11

PUMP/COMPRESSER POWER CIRCUIT
115V – 1PH

HYDRO–ACTION

PAGE 1



NOTES: MAIN PANEL DISCONNECT MUST BE PROVIDED BY INSTALLER.
DASHED LINES INDICATE ITEMS NOT CONTAINED IN THE PANEL.
FIELD WIRING MUST BE A MINIMUM OF 60°C COPPER WIRE.
REQUIRED TORQUE FOR TERMINAL BLOCK SCREWS IS 9 in–lbs.

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SPI|BIO
Wastewater Technologies

CHANGES		TOLERANCES	DRAWN BY	DATE
F		DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	06/20/04
E			MATERIAL SPECIFICATION: AS NOTED	
D				
C				
B				
A				

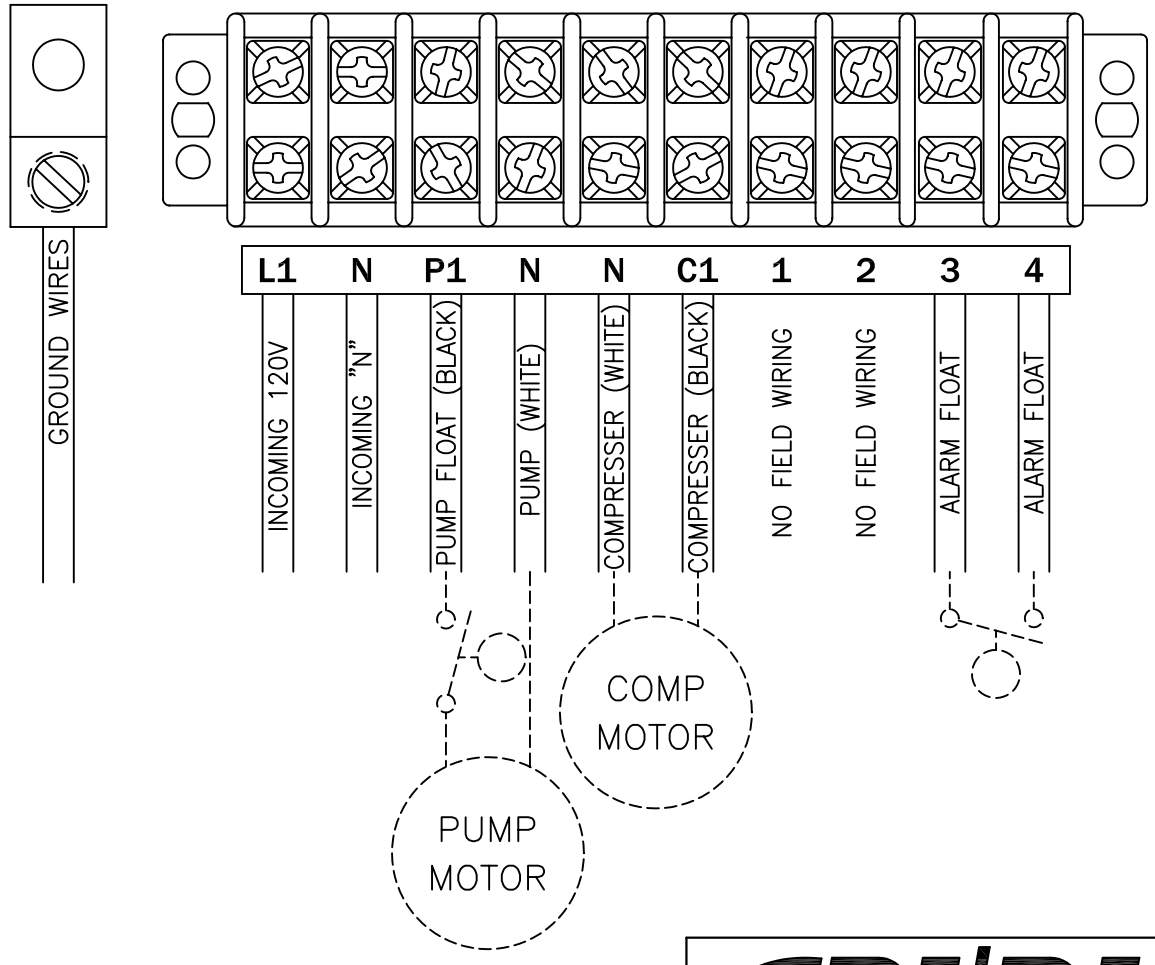
SCHEMATIC, ELECTRICAL W/TIMER & AIR SWITCH

SCALE:	PART NO.
FULL	CP–20/EC–20

TIGHTENING TORQUE FOR TERMINAL BLOCK IS 9 in-lbs.

HYDRO-ACTION

CONNECTION DIAGRAM FOR HYDRO-ACTION CP-20 & EC-20 CONTROL PANEL



ALL INFORMATION CONTAINED IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY TO SEPTIC PRODUCTS INC.

SPI/BIO
Wastewater Technologies

CHANGES	TOLERANCES	DRAWN BY	DATE
F	DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	12/15/04
E		MATERIAL SPECIFICATION: AS NOTED	
D			
C			
B			
A			

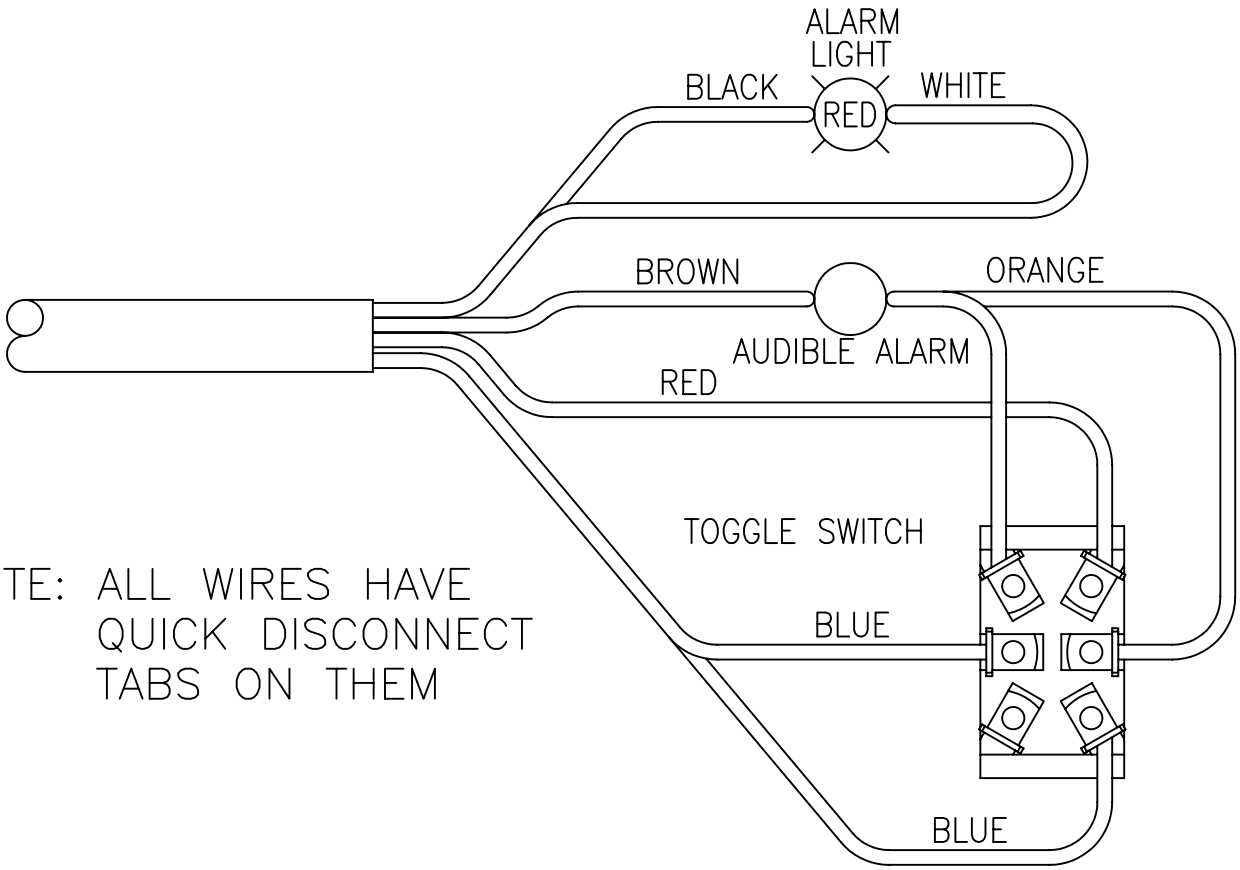
POWER CONNECTION DIAGRAM

SCALE:	PART NO.
FULL	CP-20/EC-20

TIGHTENING TORQUE FOR TERMINAL BLOCK IS 9 in-lbs.

HYDRO-ACTION

CONNECTION DIAGRAM EC-20 EXTERNAL COMPONENTS



NOTE: ALL WIRES HAVE QUICK DISCONNECT TABS ON THEM

ALL INFORMATION CONTAINED IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY TO SEPTIC PRODUCTS INC.

SPI/BIO
Wastewater Technologies

CHANGES	TOLERANCES	DRAWN BY	DATE
F	DECIMALS	D. MIDDLETON	5/20/04
E	.XXX = ±.005		
D	.XX = ±.010	MATERIAL SPECIFICATION:	
C	FRACTIONAL	AS NOTED	
B	X/X = ±.1/64		
A	ANGLES X° = ±1/2°		

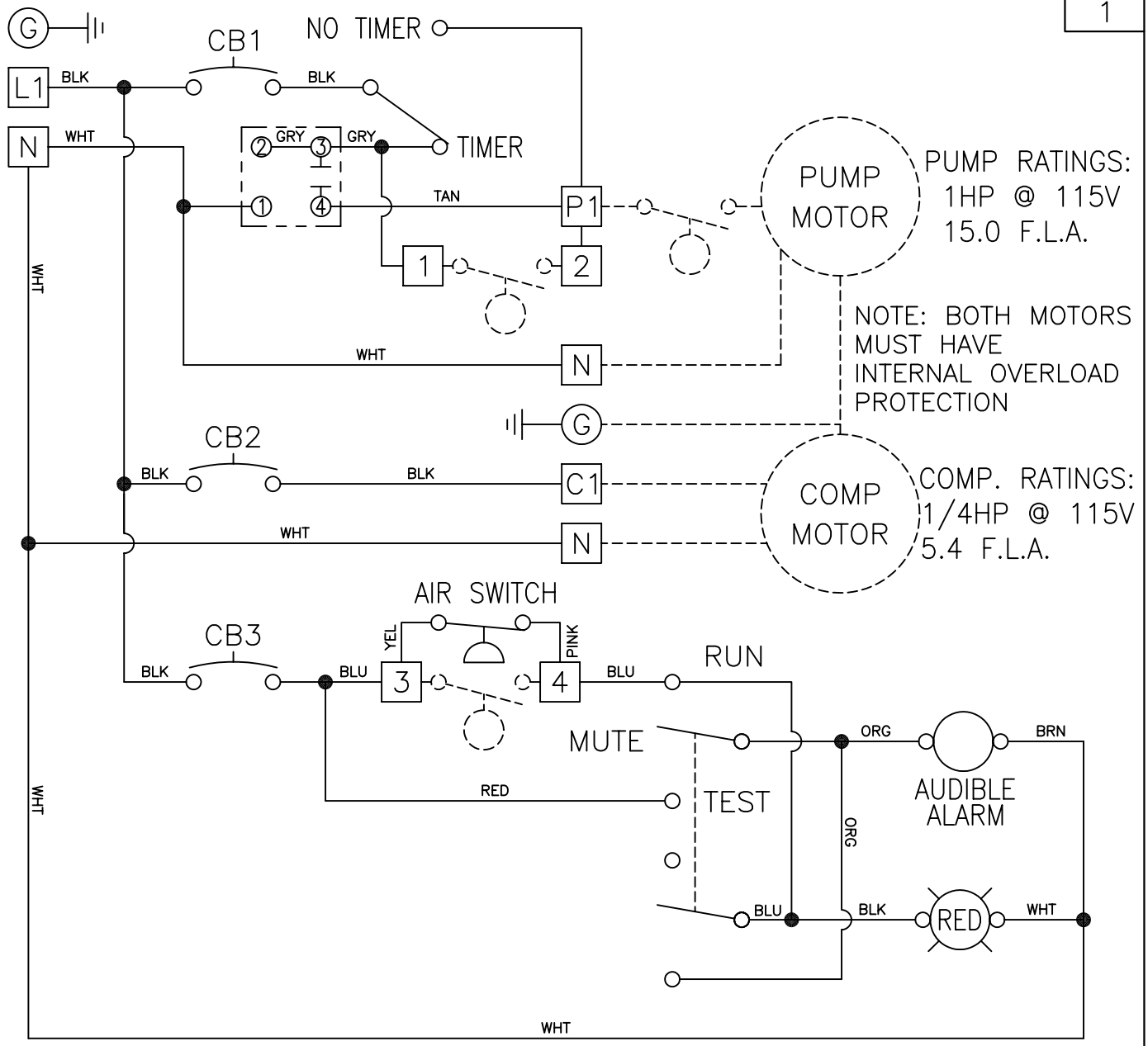
POWER CONNECTION DIAGRAM

SCALE:	PART NO.
FULL	CP-20/EC-20

PUMP/COMPRESSER POWER CIRCUIT
115V – 1PH

50B123/B122

PAGE 1



NOTES: MAIN PANEL DISCONNECT MUST BE PROVIDED BY INSTALLER.
DASHED LINES INDICATE ITEMS NOT CONTAINED IN THE PANEL.
FIELD WIRING MUST BE A MINIMUM OF 60°C COPPER WIRE.
REQUIRED TORQUE FOR TERMINAL BLOCK SCREWS IS 9 in–lbs.

ALL INFORMATION CONTAINED IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY TO SEPTIC PRODUCTS, INC.

SPI/BIO
Wastewater Technologies

CHANGES	TOLERANCES	DRAWN BY	DATE
F	DECIMALS	D. MIDDLETON	06/20/04
E	.XXX = ±.005		
D	.XX = ±.010	MATERIAL SPECIFICATION:	
C	FRACTIONAL	AS NOTED	
B	X/X = ±.1/64		
A	ANGLES		
	X° = ±1/2°		

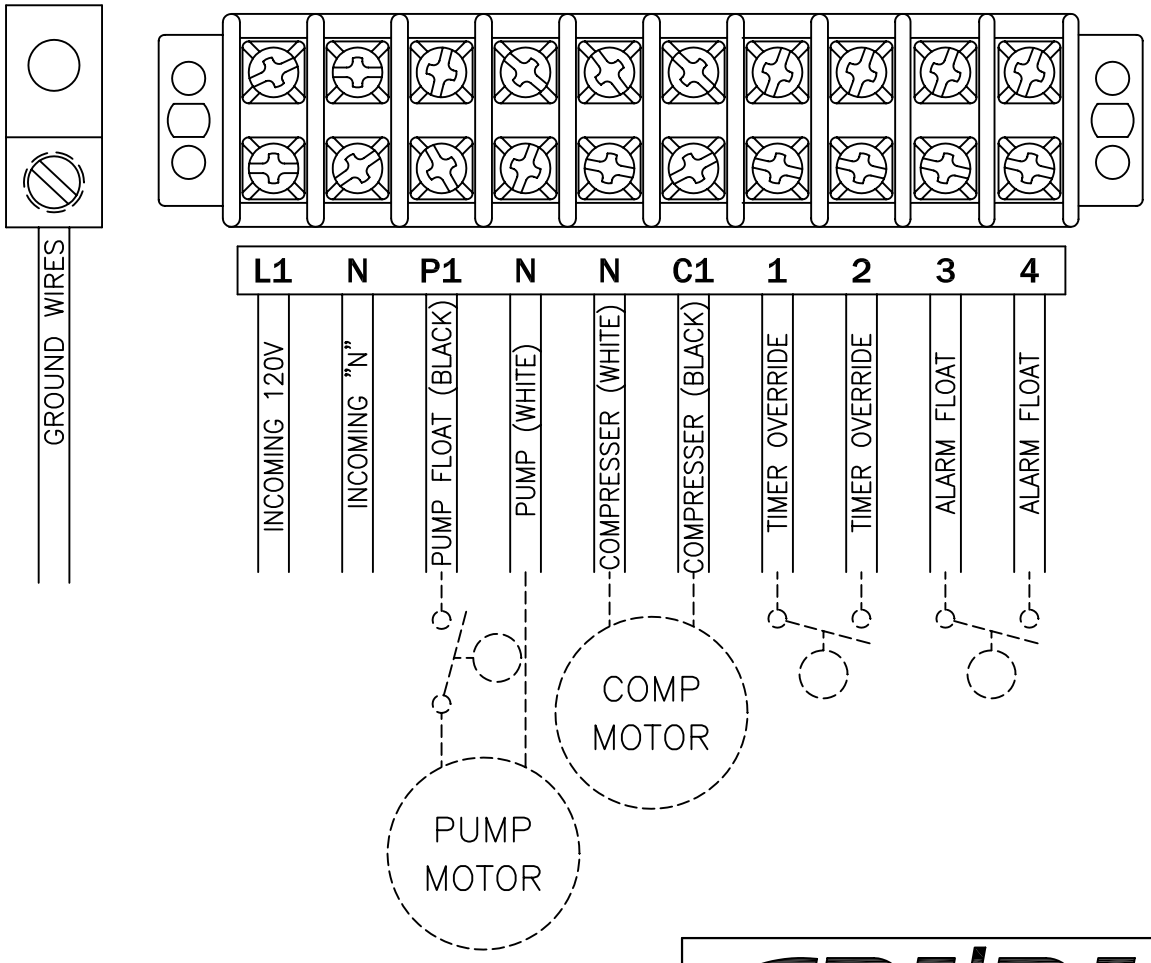
SCHEMATIC, ELECTRICAL W/TIMER & AIR SWITCH

SCALE:	PART NO.
FULL	CP–30A/EC–30A

TIGHTENING TORQUE FOR TERMINAL BLOCK IS 9 in–lbs.

HYDRO–ACTION

CONNECTION DIAGRAM FOR HYDRO-ACTION CP-30A & EC-30A CONTROL PANEL



ALL INFORMATION CONTAINED IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY TO SEPTIC PRODUCTS INC.

SPI/BIO
Wastewater Technologies

CHANGES	TOLERANCES	DRAWN BY	DATE
F	DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	12/15/04
E		MATERIAL SPECIFICATION: AS NOTED	
D			
C			
B			
A			

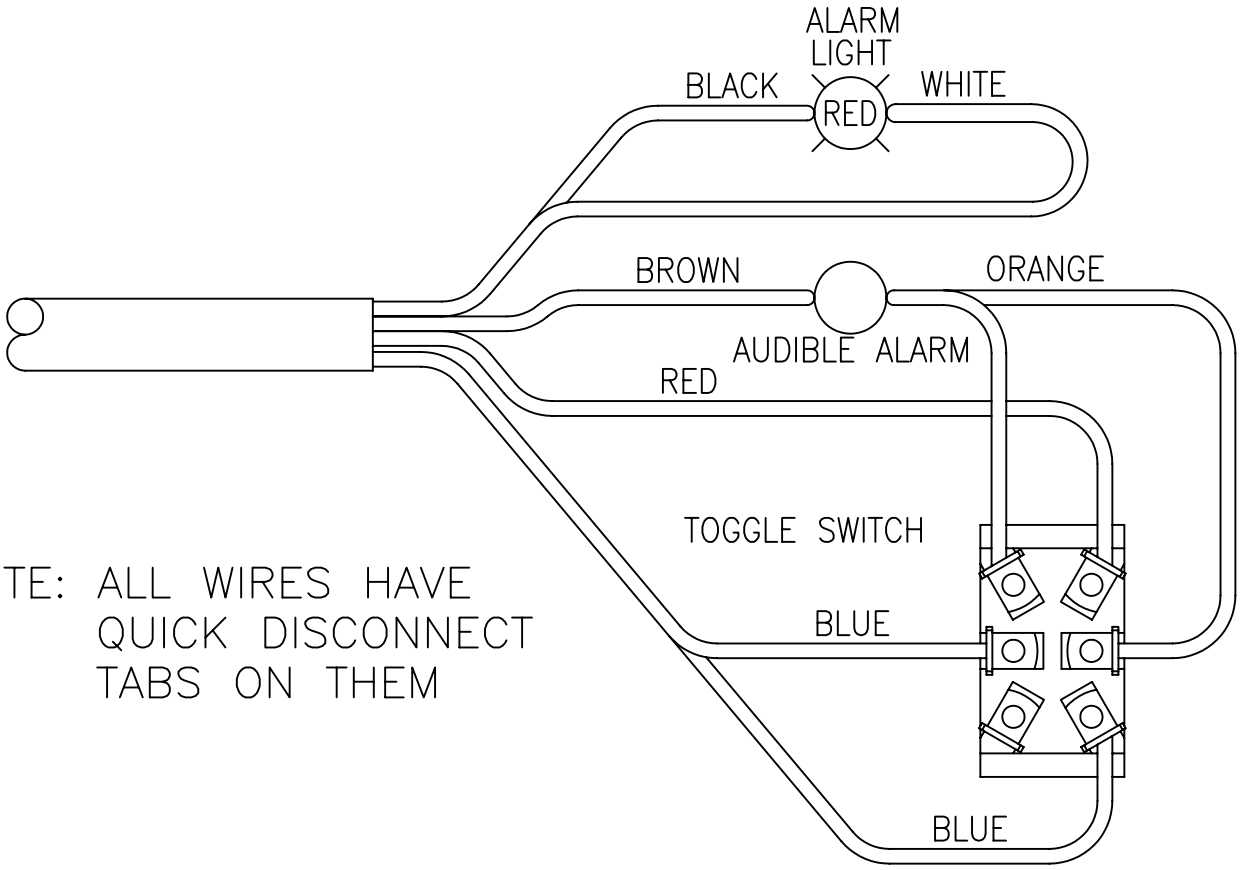
POWER CONNECTION DIAGRAM

SCALE:	PART NO.
FULL	CP–30A/EC–30A

TIGHTENING TORQUE FOR TERMINAL BLOCK IS 9 in–lbs.

HYDRO–ACTION

CONNECTION DIAGRAM EC-30A EXTERNAL COMPONENTS



NOTE: ALL WIRES HAVE QUICK DISCONNECT TABS ON THEM

ALL INFORMATION CONTAINED IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY TO SEPTIC PRODUCTS INC.

SPI/BIO
Wastewater Technologies

CHANGES		TOLERANCES	DRAWN BY	DATE
F		DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	5/20/04
E			MATERIAL SPECIFICATION: AS NOTED	
D				
C				
B				
A				

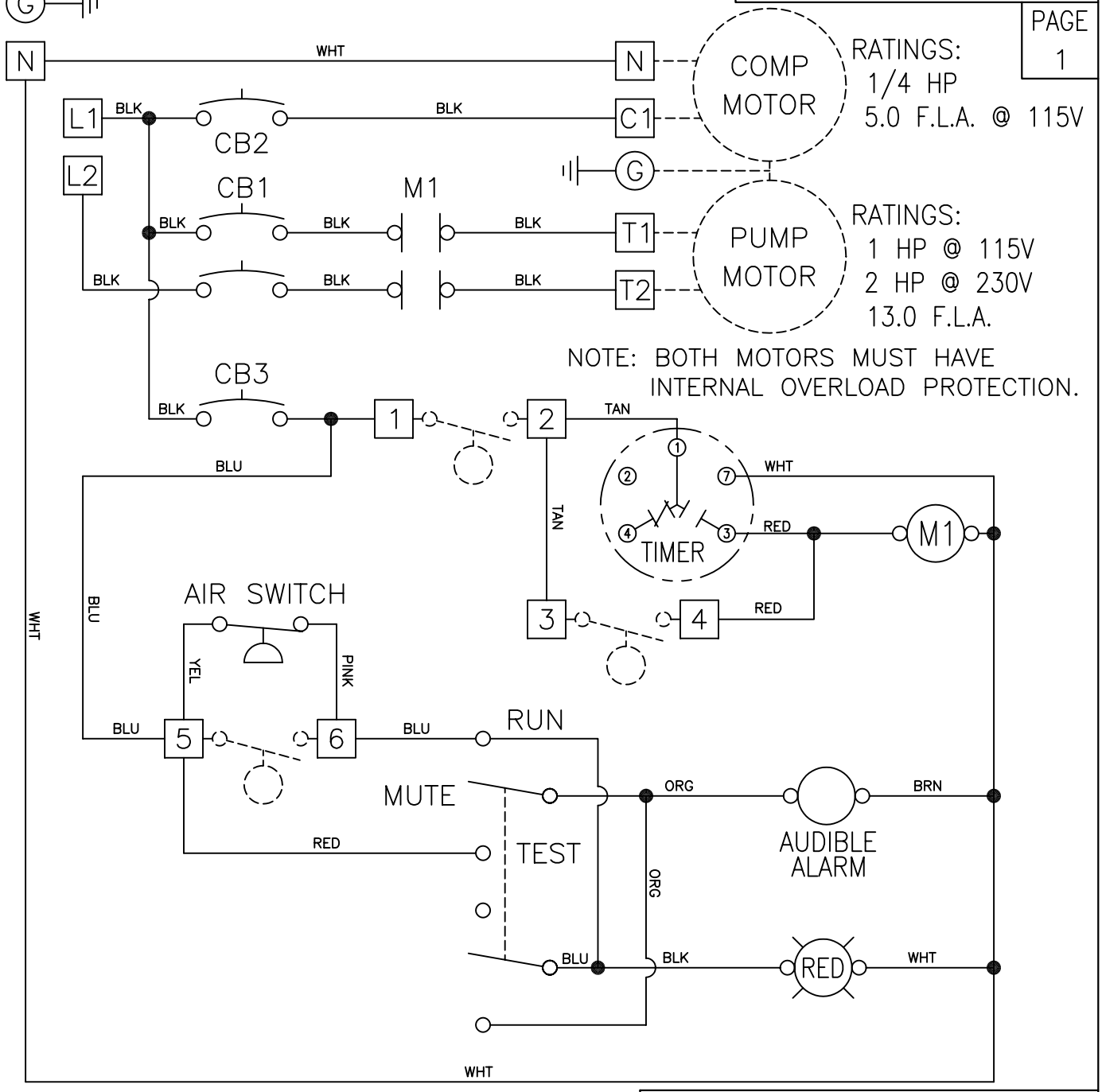
POWER CONNECTION DIAGRAM

SCALE:	PART NO.
FULL	CP–30A/EC–30A

PUMP POWER CIRCUIT
115/230V – 1PH

50B124

PAGE 1



NOTES: MAIN PANEL DISCONNECT MUST BE PROVIDED BY INSTALLER.
DASHED LINES INDICATE ITEMS NOT CONTAINED IN THE PANEL.
FIELD WIRING MUST BE A MINIMUM OF 60°C COPPER WIRE.
REQUIRED TORQUE FOR TERMINAL BLOCK SCREWS IS 9 in–lbs.

SPI|BIO
Wastewater Technologies

CHANGES		TOLERANCES	DRAWN BY	DATE
F		DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	06/20/04
E			MATERIAL SPECIFICATION: AS NOTED	
D				
C				
B				
A				

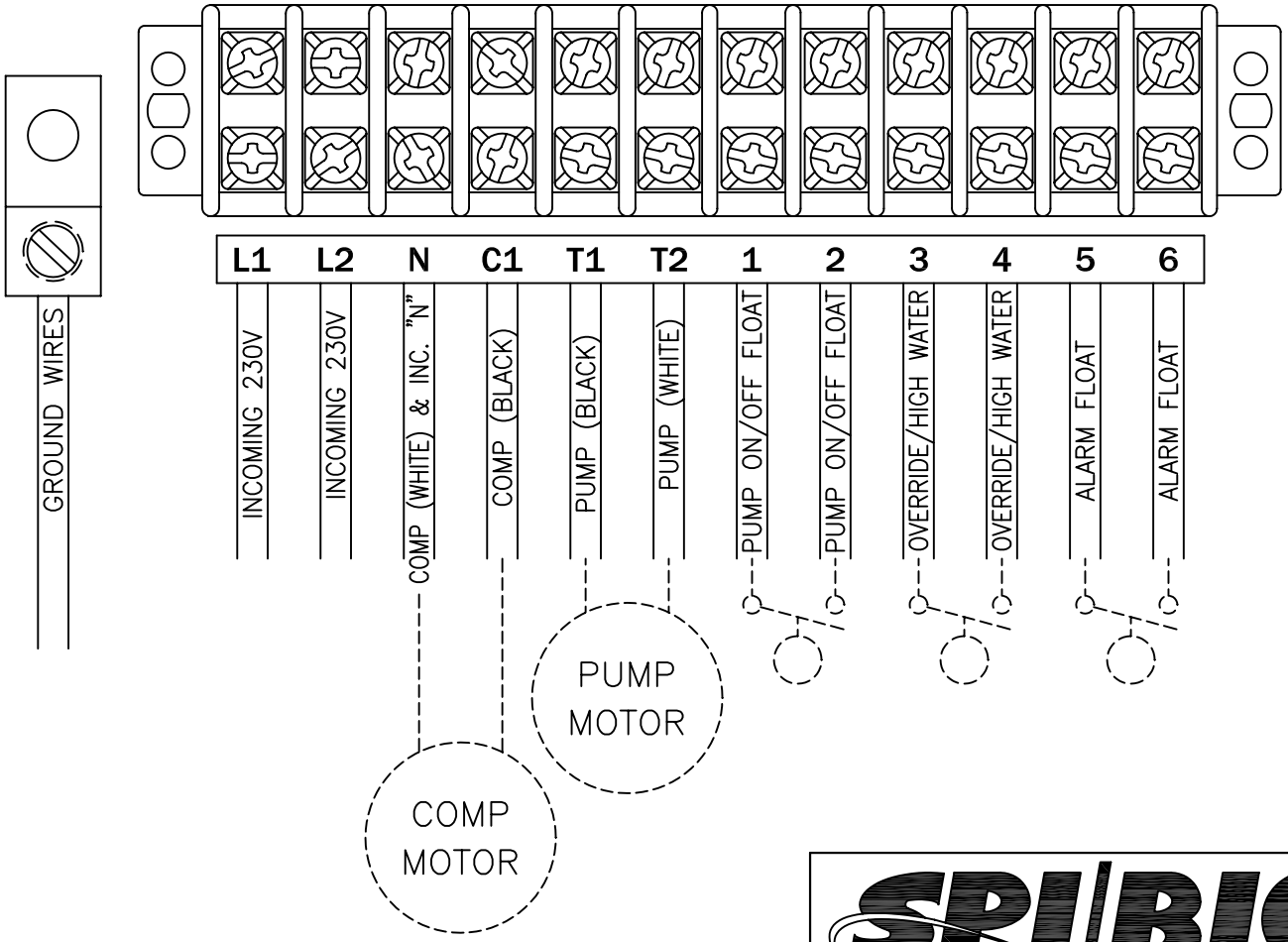
SCHEMATIC, ELECTRICAL
SIMPLEX 115/230V

SCALE:	PART NO.
FULL	CP–32A2/EC–32A2

TIGHTENING TORQUE FOR TERMINAL BLOCK IS 9 in–lbs.

HYDRO–ACTION

CONNECTION DIAGRAM FOR HYDRO-ACTION EC-32A2 & CP32A2 CONTROL PANEL (230V)



ALL INFORMATION CONTAINED IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY TO SEPTIC PRODUCTS INC.

SPI/BIO
Wastewater Technologies

CHANGES	TOLERANCES	DRAWN BY	DATE
F	DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	12/15/04
E		MATERIAL SPECIFICATION: AS NOTED	
D			
C			
B			
A			

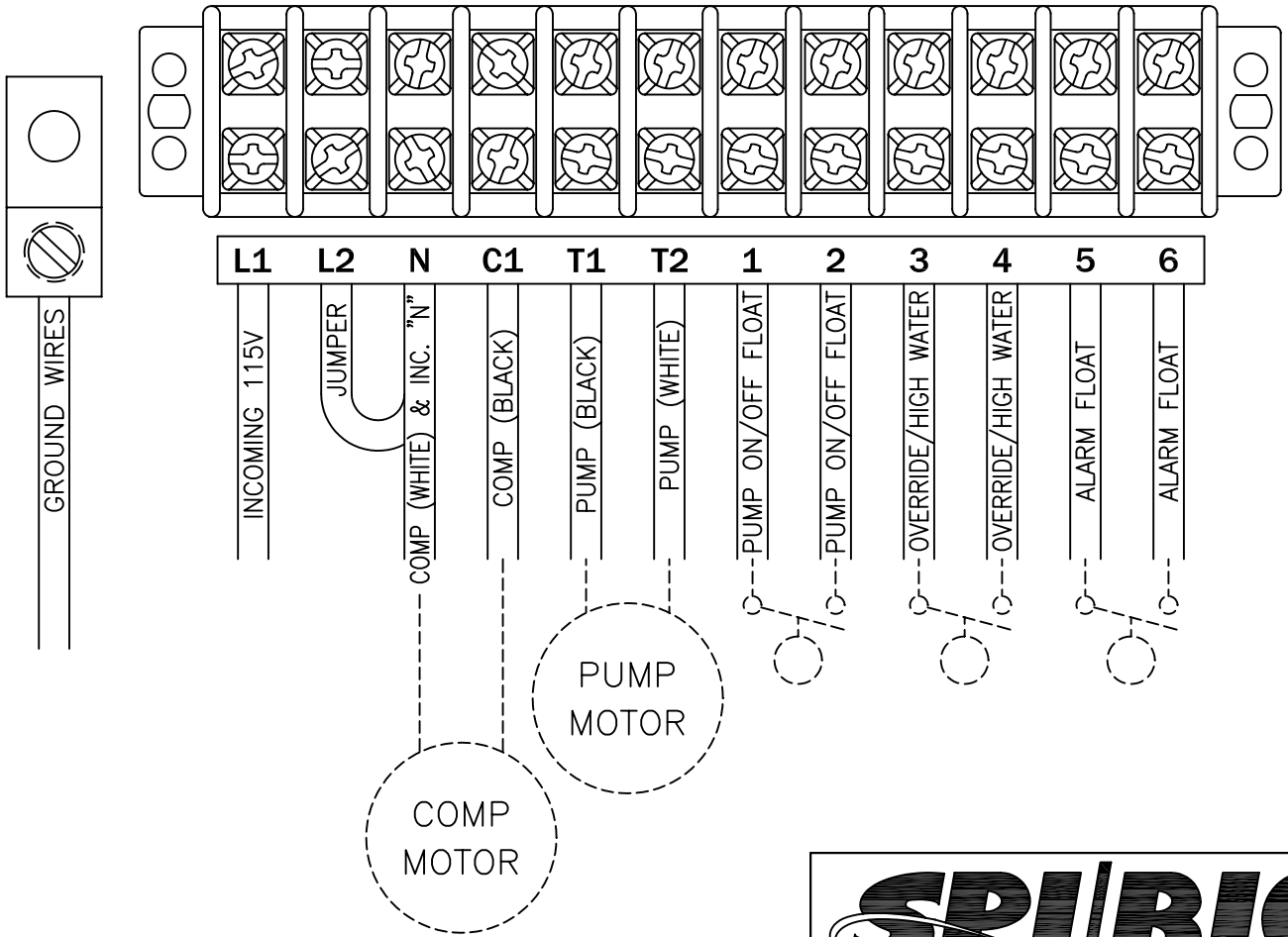
POWER CONNECTION DIAGRAM

SCALE:	PART NO.
FULL	EC–32A2/CP–32A2

TIGHTENING TORQUE FOR TERMINAL BLOCK IS 9 in–lbs.

HYDRO–ACTION

CONNECTION DIAGRAM FOR HYDRO-ACTION EC-32A2 & CP32A2 CONTROL PANEL (115V)



ALL INFORMATION CONTAINED IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY TO SEPTIC PRODUCTS INC.

SPI/BIO Wastewater Technologies

CHANGES		TOLERANCES	DRAWN BY	DATE
F		DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	12/15/04
E			MATERIAL SPECIFICATION: AS NOTED	
D				
C				
B				
A				

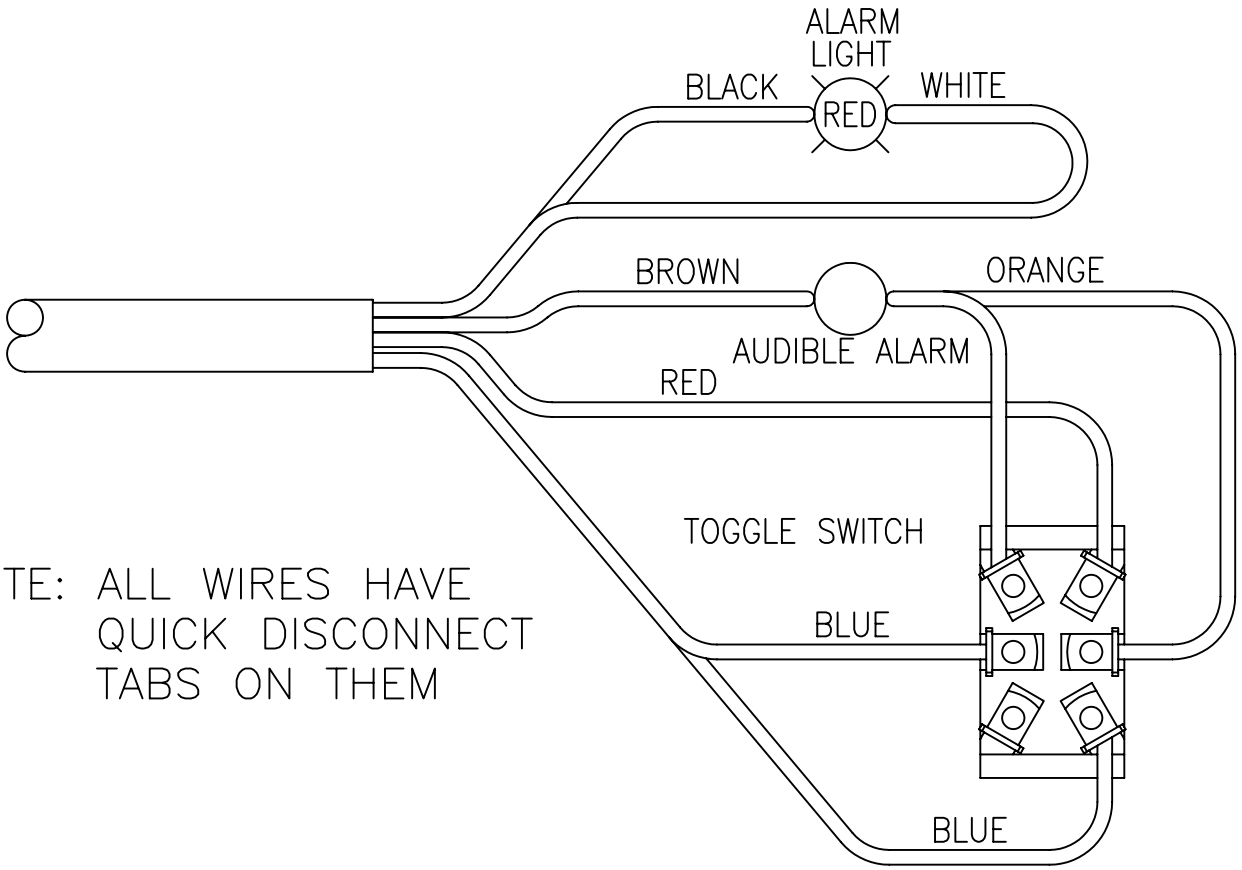
POWER CONNECTION DIAGRAM (EC–32A2)

SCALE:	PART NO.
FULL	EC–32A2/CP32A2

TIGHTENING TORQUE FOR TERMINAL BLOCK IS 9 in–lbs.

HYDRO–ACTION

CONNECTION DIAGRAM EC-32A2 EXTERNAL COMPONENTS



NOTE: ALL WIRES HAVE QUICK DISCONNECT TABS ON THEM

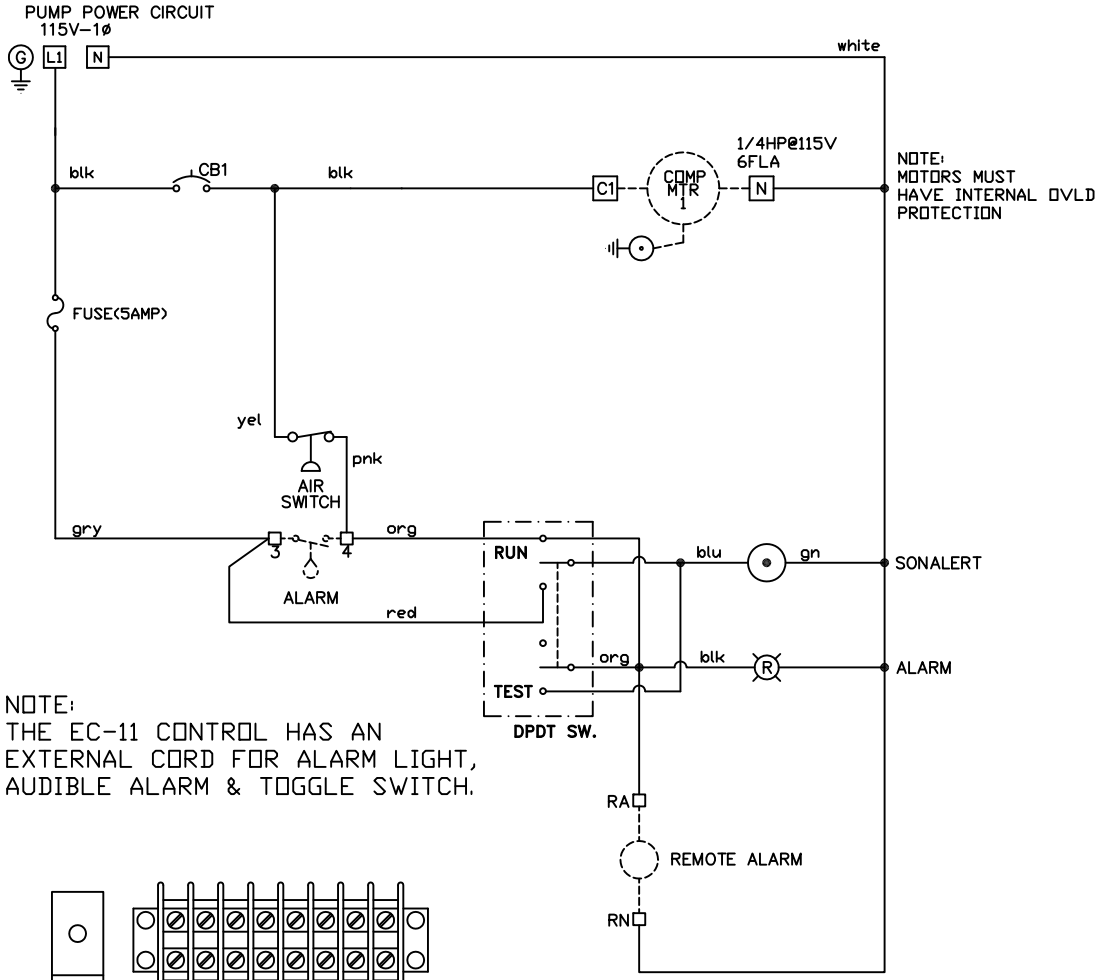
ALL INFORMATION CONTAINED IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY TO SEPTIC PRODUCTS INC.

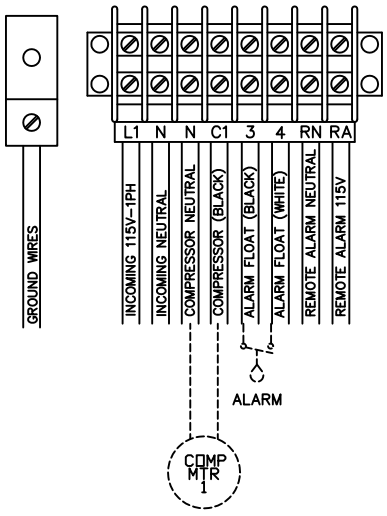
SPI/BIO
Wastewater Technologies

CHANGES	TOLERANCES	DRAWN BY	DATE
F	DECIMALS	D. MIDDLETON	5/20/04
E	.XXX = ±.005		
D	.XX = ±.010	MATERIAL SPECIFICATION:	
C	FRACTIONAL	AS NOTED	
B	X/X = ±.1/64		
A	ANGLES X° = ±1/2°		

POWER CONNECTION DIAGRAM

SCALE:	PART NO.
FULL	EC–32A2

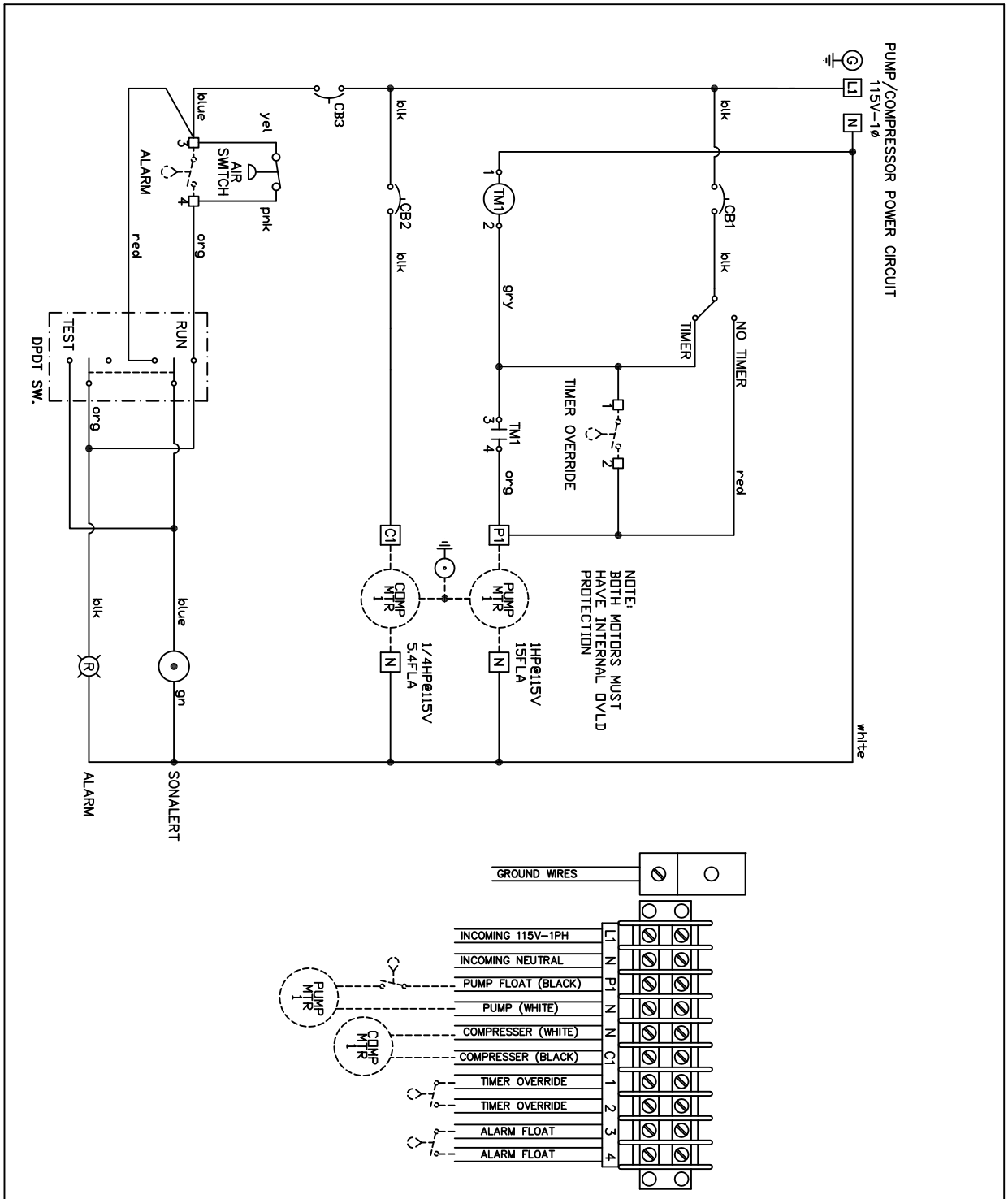




VOLTAGE:	PHASE:	HERTZ:	HP/FLA:
115V	1	60	0.25/6
ENCLOSURE TYPE: 4X			
SHORT CIRCUIT CURRENT: 5KA			
RMS SYMMETRICAL, 120V MAXIMUM			

OEC

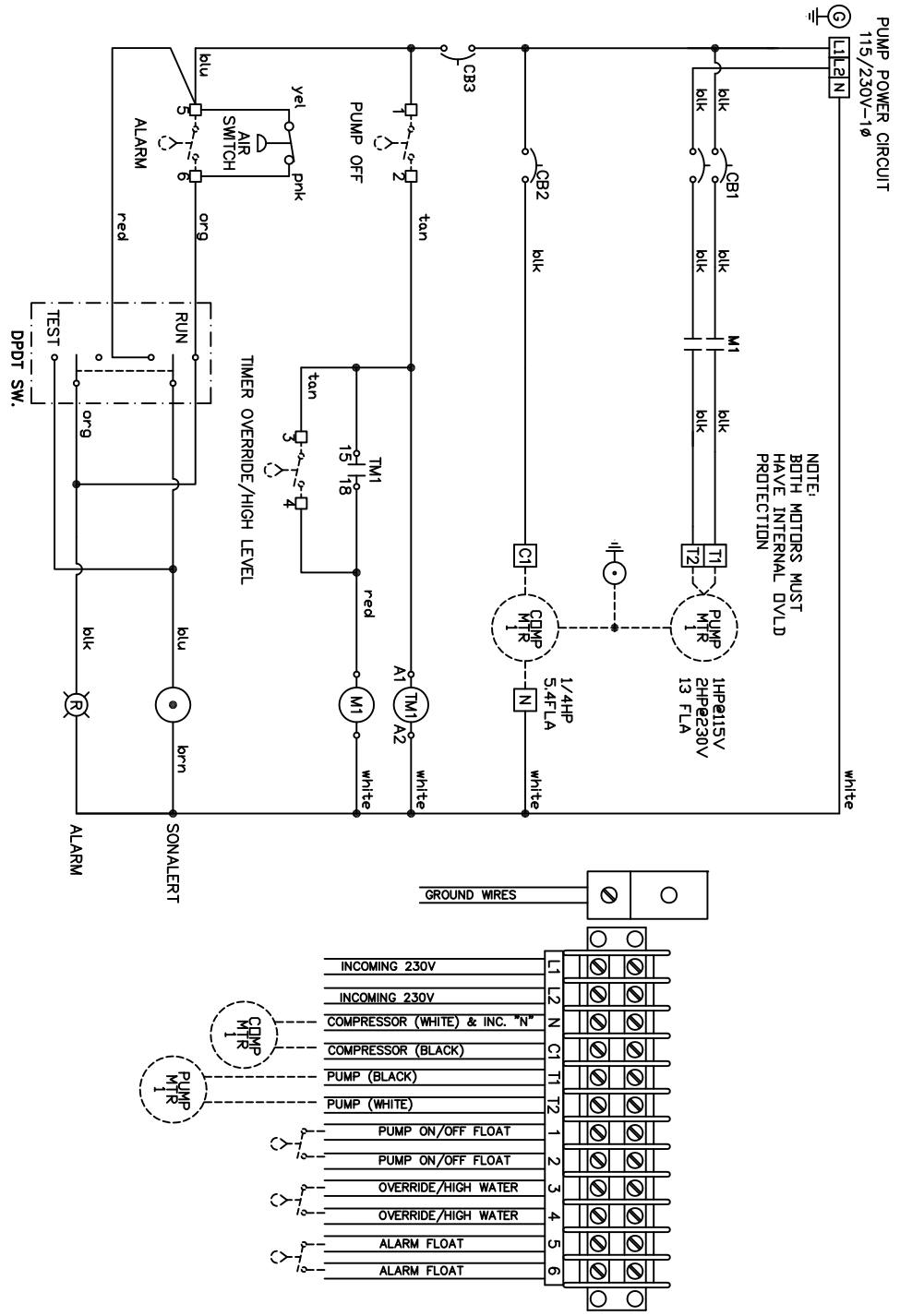
TITLE: EC-11/CP-11		
PAGES: SHEET ___ OF ___		
DATE: 10-08	REV DATE:	DWG. NO.: 081009DB40



VOLTAGE:	PHASE:	HERTZ:	HP/FLA:
115V	1	60	1/15
ENCLOSURE TYPE: 4X			
SHORT CIRCUIT CURRENT: 5KA			
RMS SYMMETRICAL, 120V MAXIMUM			

OEC

TITLE: CP-30A/EC-30A		
PAGES: SHEET ___ OF ___		
DATE: 10-08	REV DATE:	DWG. NO.: 081009DB42



VOLTAGE:	PHASE:	HERTZ:	HP/FLA:
230V	1	60	1/7.5
ENCLOSURE TYPE: 4X			
SHORT CIRCUIT CURRENT: 5KA			
RMS SYMMETRICAL, 240V MAXIMUM			

OEC

TITLE: EC-32A2		
PAGES: SHEET ___ OF ___		
DATE: 10-08	REV DATE:	DWG. NO.: 081009DB47

Appendix 5: Drawings

AP Series PVC Air Header Tee Assembly (units prior to 2009) .....

AP Series **Hydro-Action® Industries** Rotary Air Pump.....

AP Series **Hydro-Action® Industries** Linear Air Pump.....

AP Series Schrader Air Pressure Valve & Quick Chuck Pressure Gauge (Rotary).....

AP Series Schrader Air Pressure Valve & Quick Chuck Pressure Gauge (Linear).....

AP Series WWTP Installation Details .....

AP Series OPS® Data Plate .....

AP Series Data Plate .....

AP Series Anchored Diffuser Assembly Used prior to 2010.....

AP Series Anchored Diffuser Assembly New Model 07/09 to present .....

AP Series 6” Poly Loc Riser .....

AP Series 6” Tuff-tite Riser .....

AP Series WWTP Process Flow Diagram .....

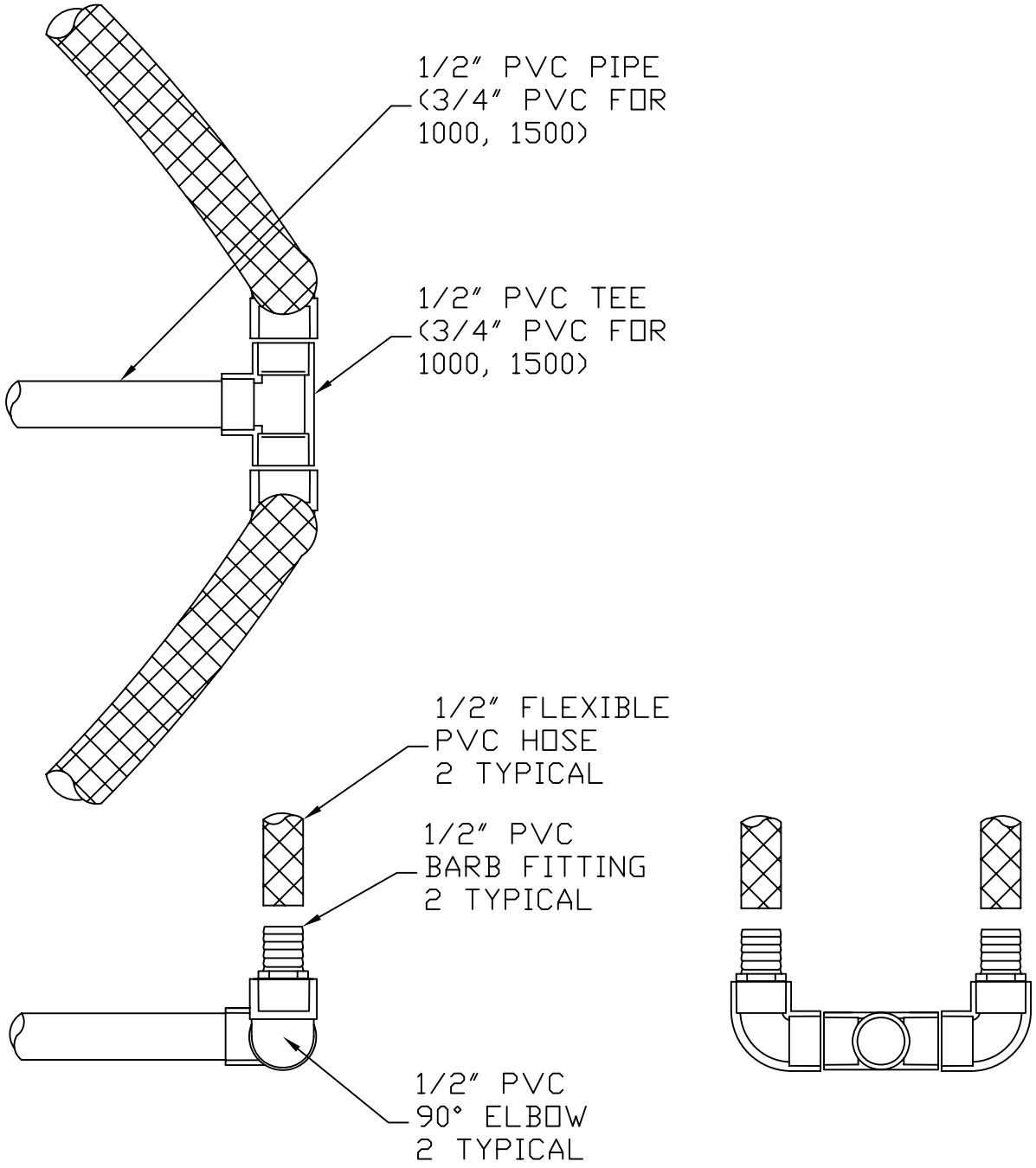
AP-500, AP-600, AP-750 Plant Detail .....

AP-1000G, AP-1500G Plant Detail .....

OPS® Models 50-30 and 50-32 Timer .....

Float Setting Diagram.....…

PVC AIR HEADER TEE ASSEMBLY



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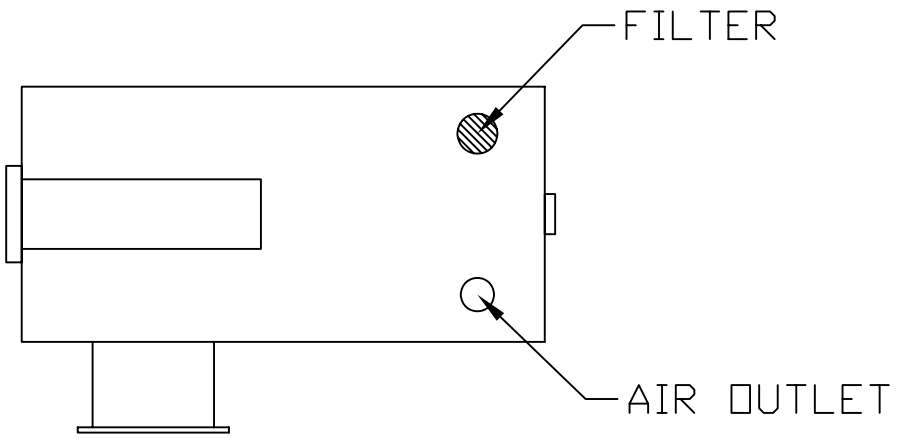
green from the ground up

NOTE: USED ON UNITS PRIOR TO 2010

ROTARY MOTOR



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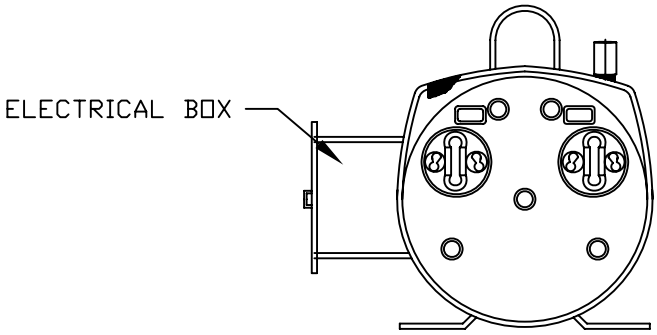

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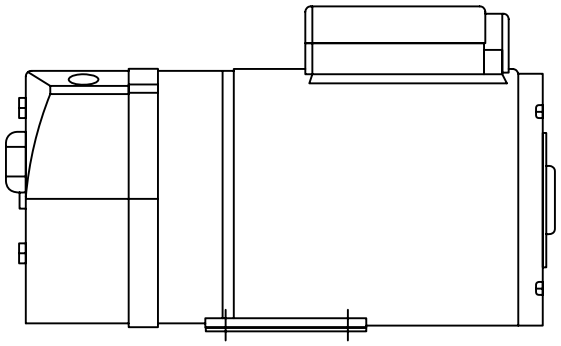

SIDE

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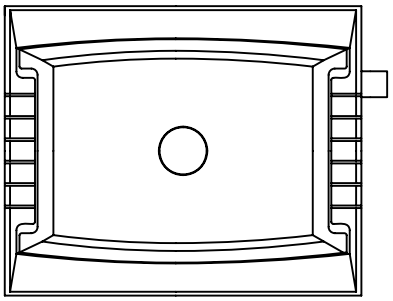
LINEAR MOTOR



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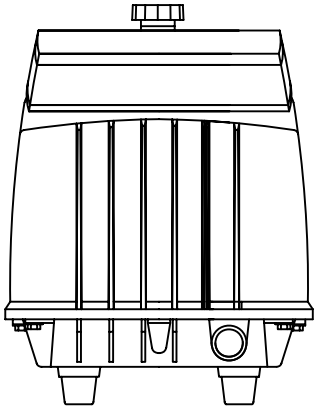

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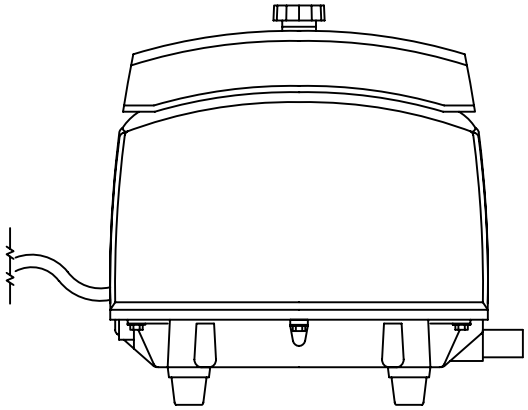

SIDE

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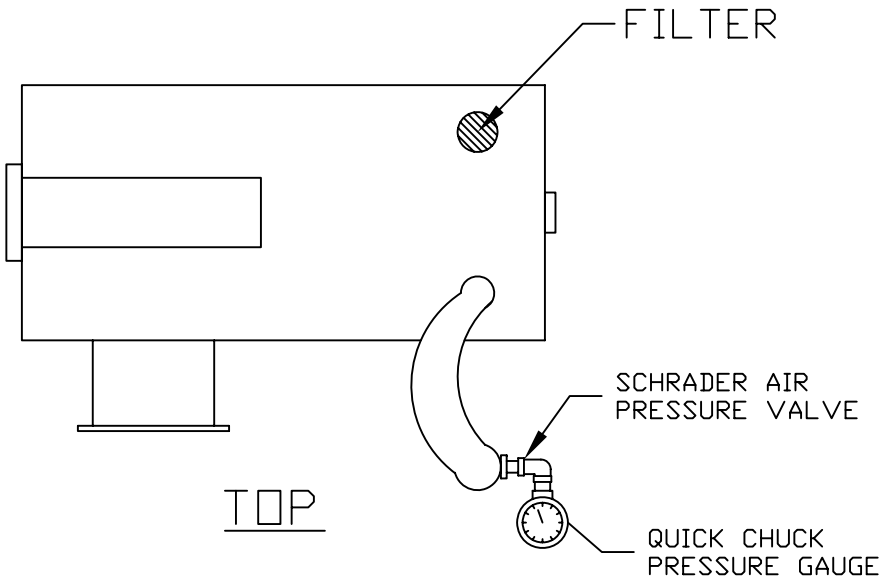
ROTARY MOTOR W/ SCHRADER VALVE & QUICK CHUCK PRESSURE GAUGE



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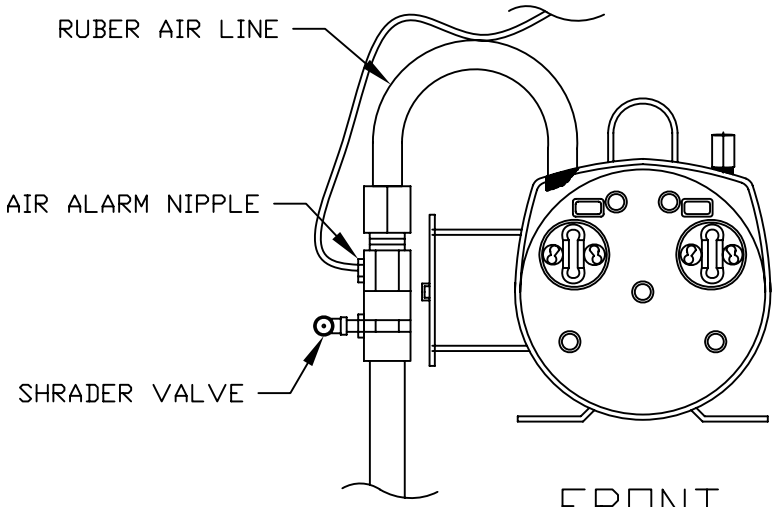

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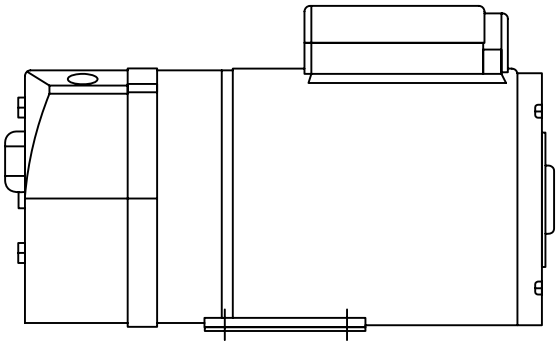

SIDE

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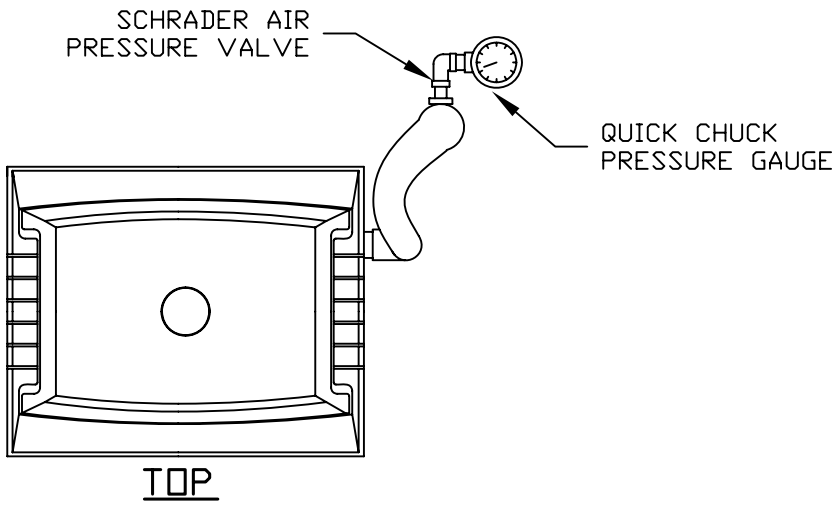
LINEAR MOTOR W/ SCHRADER VALVE & QUICK CHUCK PRESSURE GAUGE



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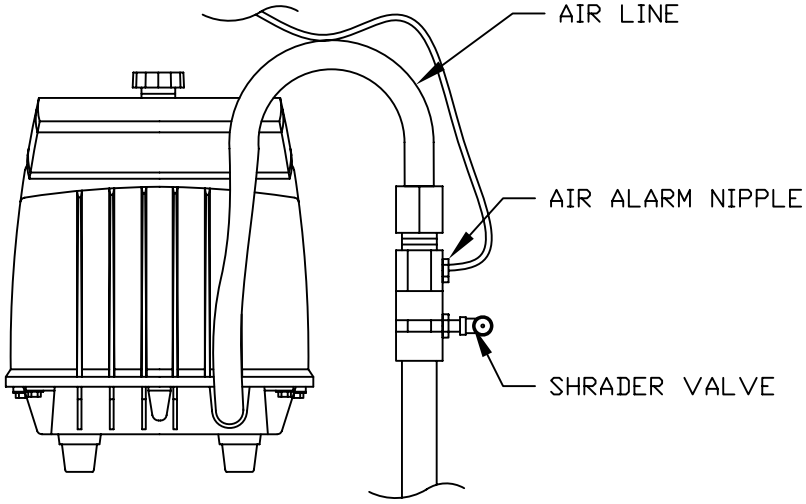

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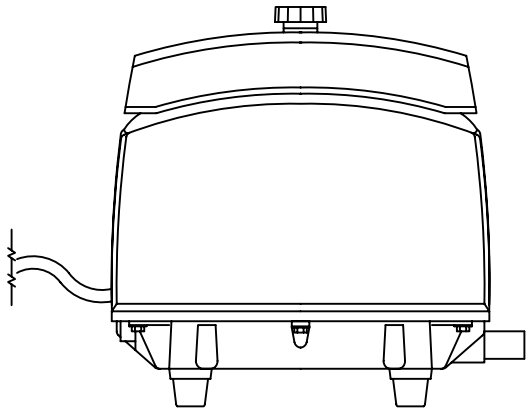

SIDE

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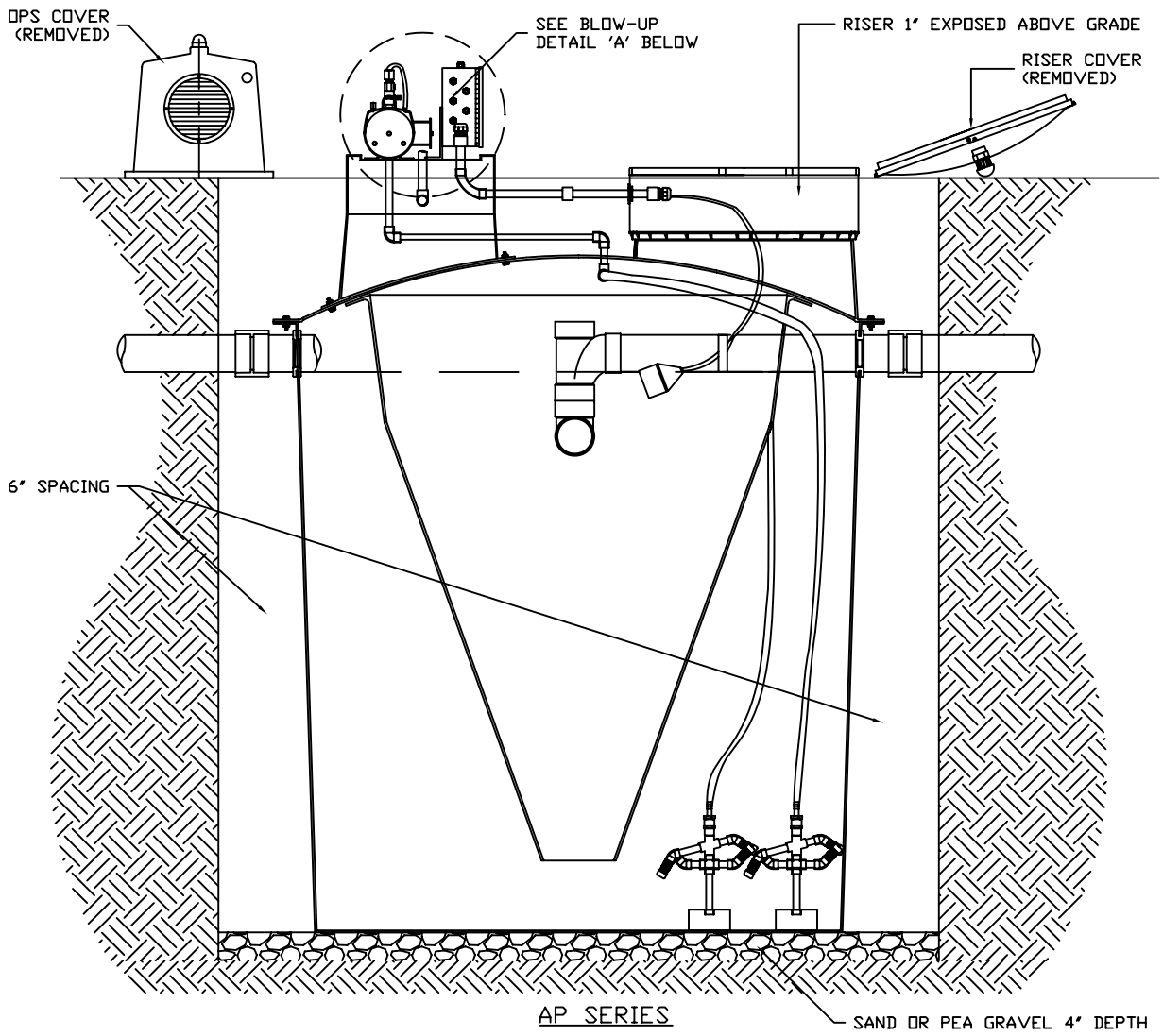
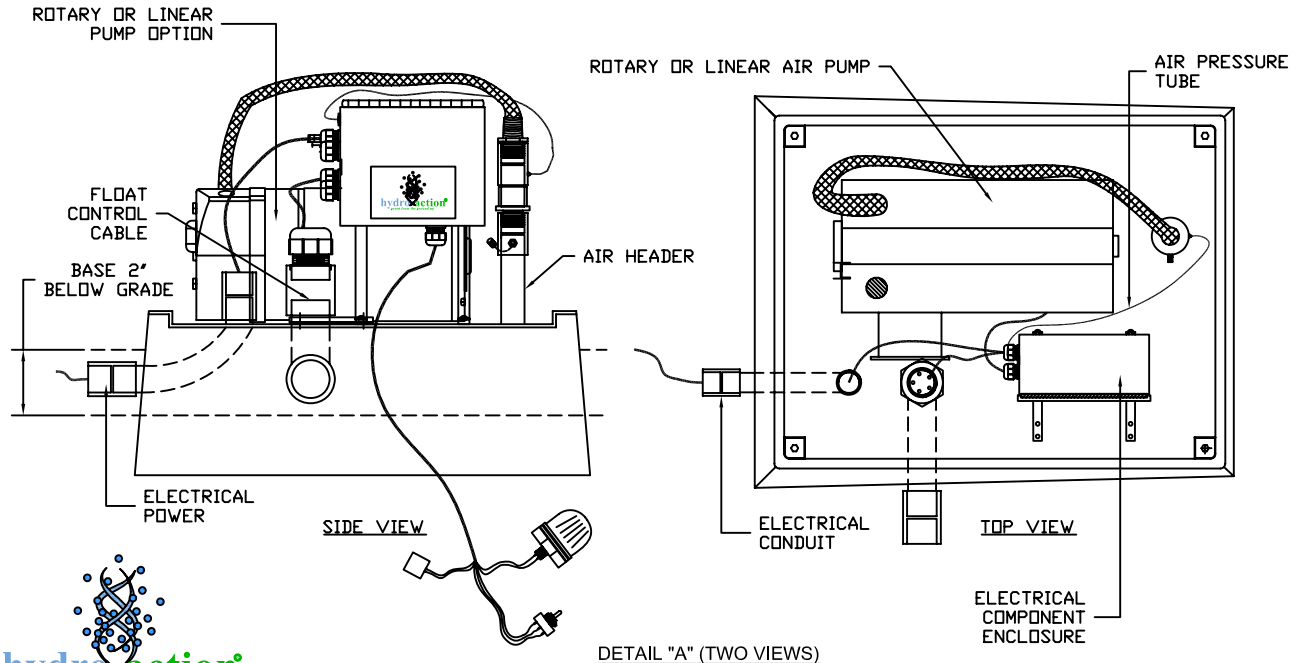
INSTALLATION DETAILS


OPS COVER (REMOVED)
SEE BLOW-UP DETAIL 'A' BELOW
RISER 1" EXPOSED ABOVE GRADE
RISER COVER (REMOVED)
6" SPACING
SAND OR PEA GRAVEL 4" DEPTH

AP SERIES



DETAIL "A" (TWO VIEWS)
AIR PUMP / CONTROL PANEL

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OPS DATA PLATE

NORMAL/SILENCE

AP Class 1 WWTP CAP: GPD

MODEL - - OPS

SERIAL NUMBER

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green from the ground up

NSF®
Certified to NSF/ANSI Standard 40

1919 JIM NEU DR.
PLYMOUTH, INDIANA

PLACE SERVICE PROVIDER LABEL HERE

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green from the ground up

DATA PLATE

MODEL AP-500
CLASS 1 WWTP

CAPACITY 500GPD

hydro action®
green from the ground up

1919 JIM NEU DR.
PLYMOUTH, INDIANA
U.S. PATENT # PENDING

NSF®
Certified to NSF/ANSI Standard 40

SERIAL# _____

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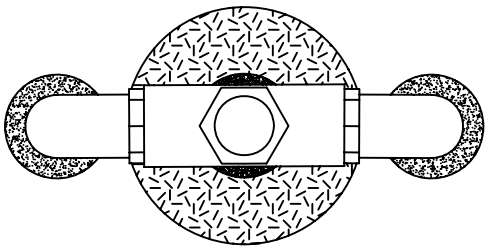
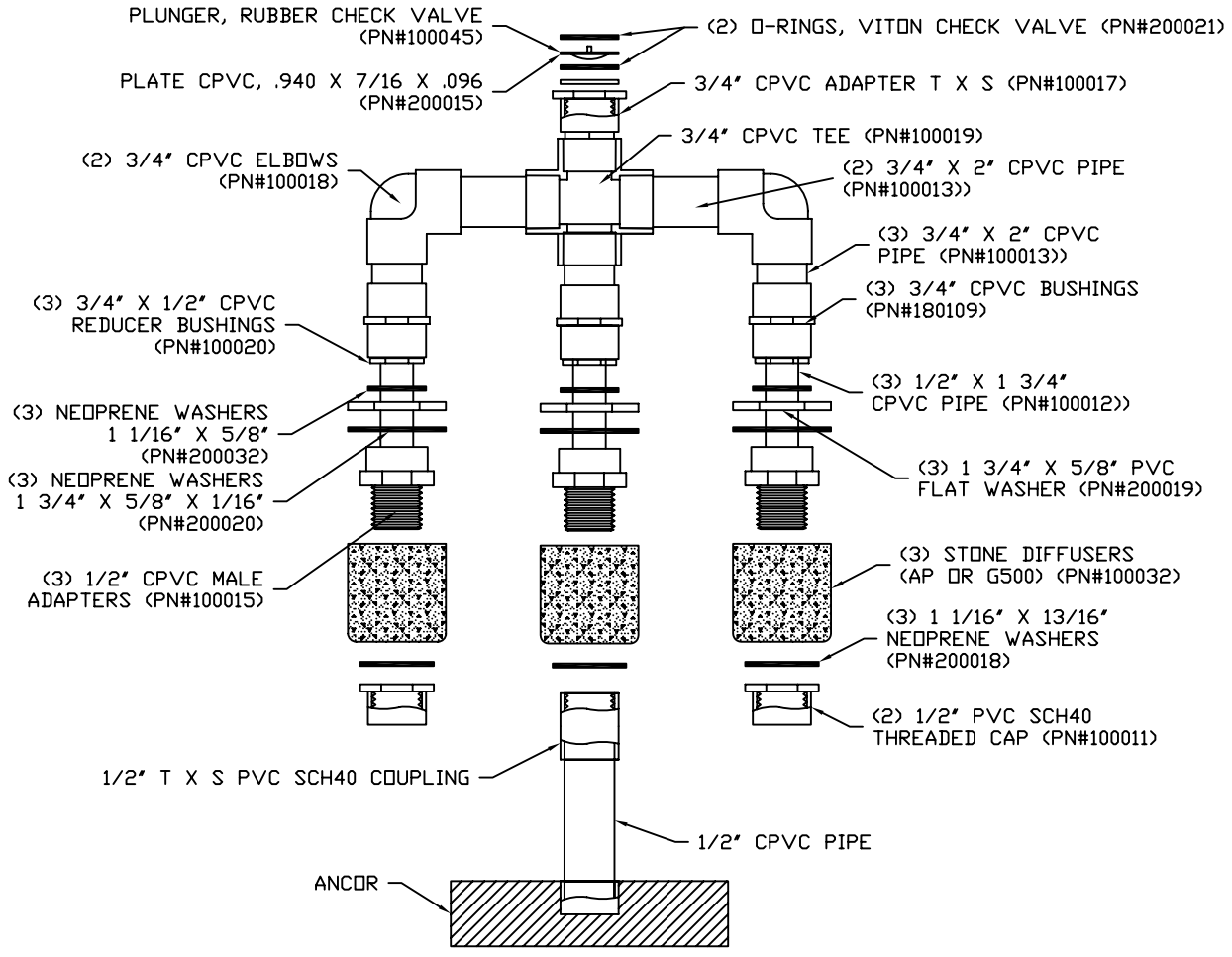
ANCHORED DIFFUSER ASSEMBLY




PLUNGER, RUBBER CHECK VALVE (PN#100045)
PLATE CPVC, .940 X 7/16 X .096 (PN#200015)
(2) O-RINGS, VITON CHECK VALVE (PN#200021)
3/4" CPVC ADAPTER T X S (PN#100017)
3/4" CPVC TEE (PN#100019)
(2) 3/4" CPVC ELBOWS (PN#100018)
(2) 3/4" X 2" CPVC PIPE (PN#100013))
(3) 3/4" X 2" CPVC PIPE (PN#100013))
(3) 3/4" CPVC BUSHINGS (PN#180109)
(3) 3/4" X 1/2" CPVC REDUCER BUSHINGS (PN#100020)
(3) 1/2" X 1 3/4" CPVC PIPE (PN#100012))
(3) NEOPRENE WASHERS 1 1/16" X 5/8" (PN#200032)
(3) 1 3/4" X 5/8" PVC FLAT WASHER (PN#200019)
(3) NEOPRENE WASHERS 1 3/4" X 5/8" X 1/16" (PN#200020)
(3) STONE DIFFUSERS (AP OR G500) (PN#100032)
(3) 1/2" CPVC MALE ADAPTERS (PN#100015)
(3) 1 1/16" X 13/16" NEOPRENE WASHERS (PN#200018)
(2) 1/2" PVC SCH40 THREADED CAP (PN#100011)
1/2" T X S PVC SCH40 COUPLING
1/2" CPVC PIPE
ANCOR

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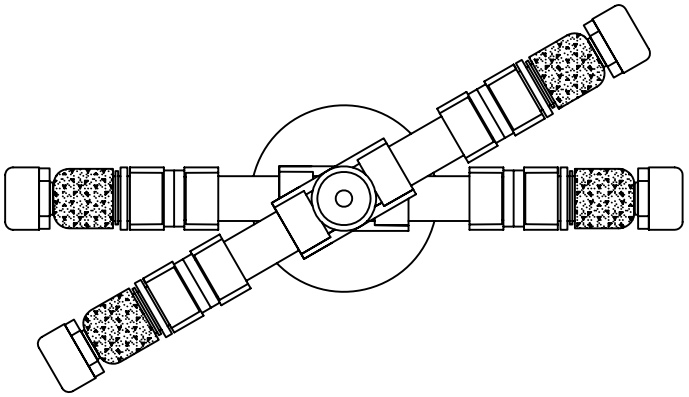
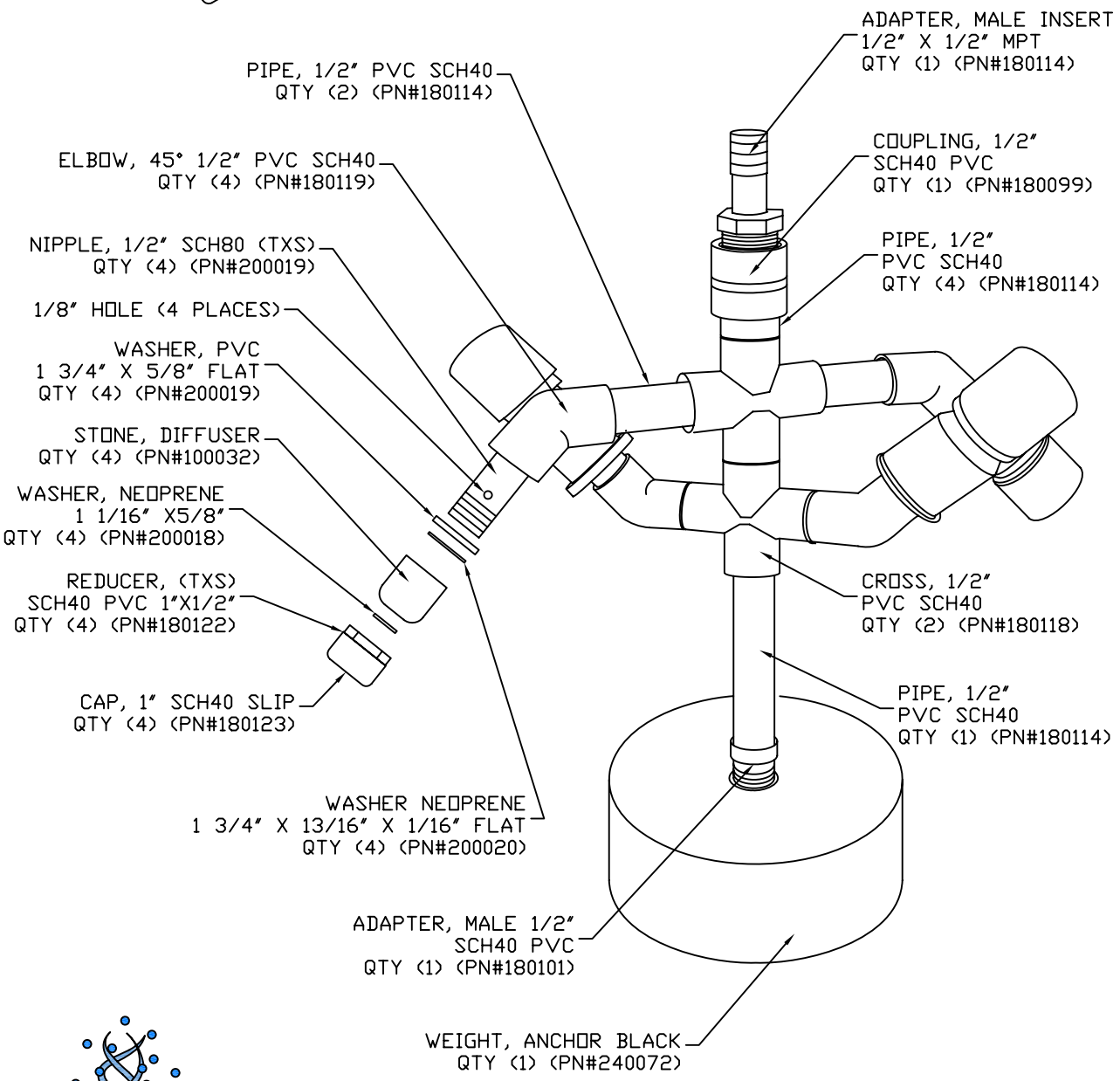
NOTE: USED PRIOR TO 2010

ANCHORED DIFFUSER ASSEMBLY





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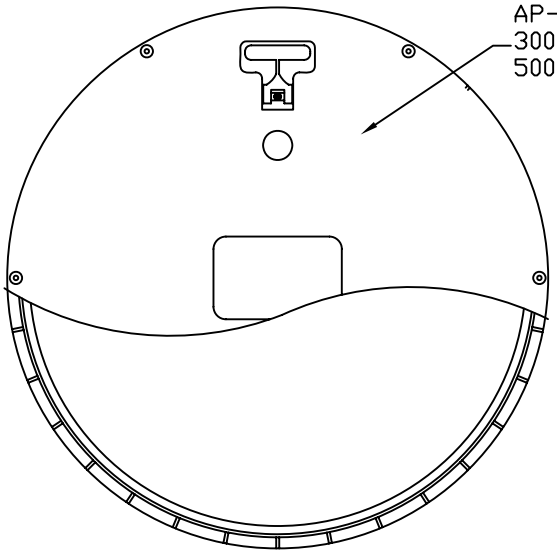
green from the ground up

NOTE: USED 7/09 TO PRESENT

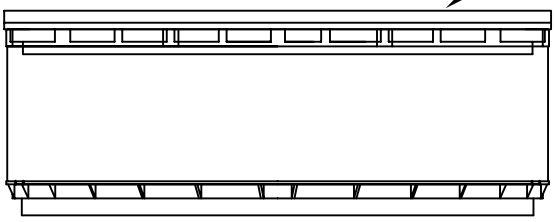
AP SERIES POLY LOC 6" RISER

AP-500, AP-600, AP-750 HAVE ON 24" RISER
AP-100G & AP-1500 HAVE TWO 20" RISERS
300 GALLON PRE/PUMP TANKS HAVE 20"
500-750 GALLON PRE/PUMP TANKS HAVE 24"



TOP

ACCESS COVER



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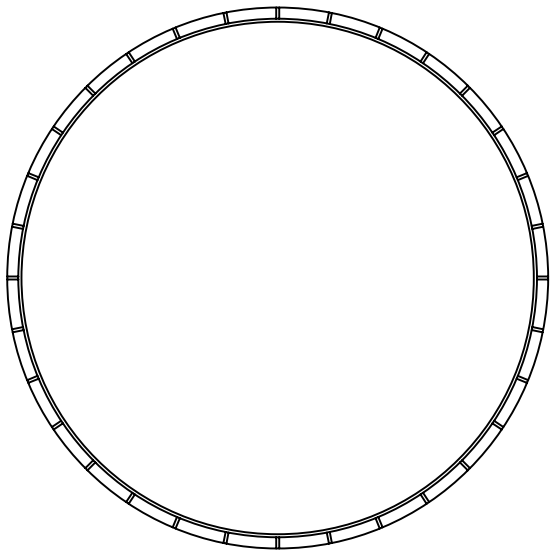

BOTTOM

NOTES:

1. COVER HAS MOLDED IN GASKET.
2. INTERLOCKING DESIGN FOR STACKING RISERS.
3. 6" RISER

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green from the ground up

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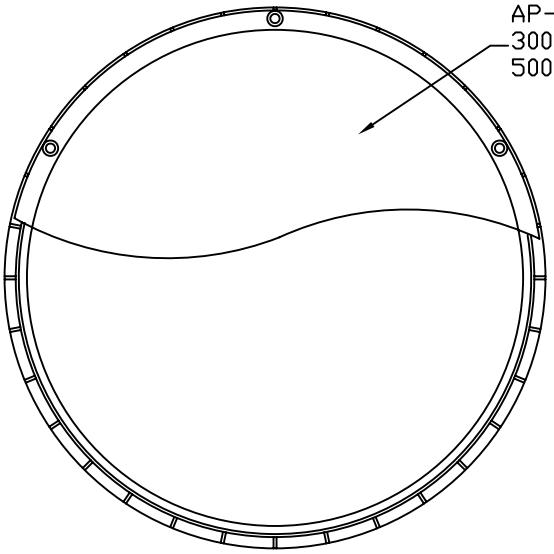
AP SERIES TUFF TITE 6″ RISER

AP-500, AP-600, AP-750 HAVE ON 24″ RISER
AP-100G & AP-1500 HAVE TWO 20″ RISERS
300 GALLON PRE/PUMP TANKS HAVE 20″
500-750 GALLON PRE/PUMP TANKS HAVE 24″



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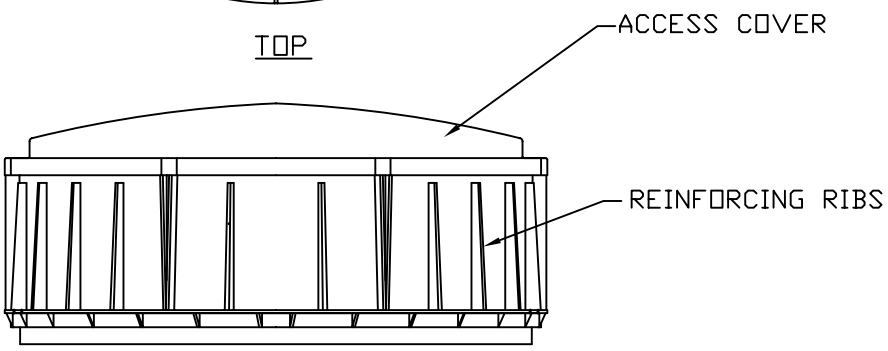

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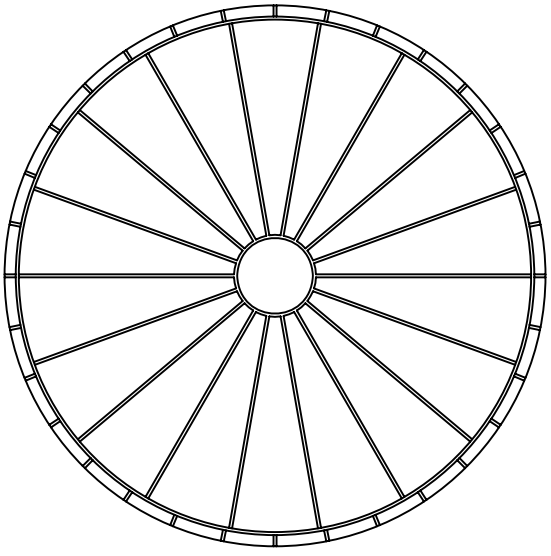

BOTTOM

NOTES:
1. COVER HAS MOLDED IN GASKET.
2. INTERLOCKING DESIGN FOR STACKING RISERS.
3. 6″ RISER

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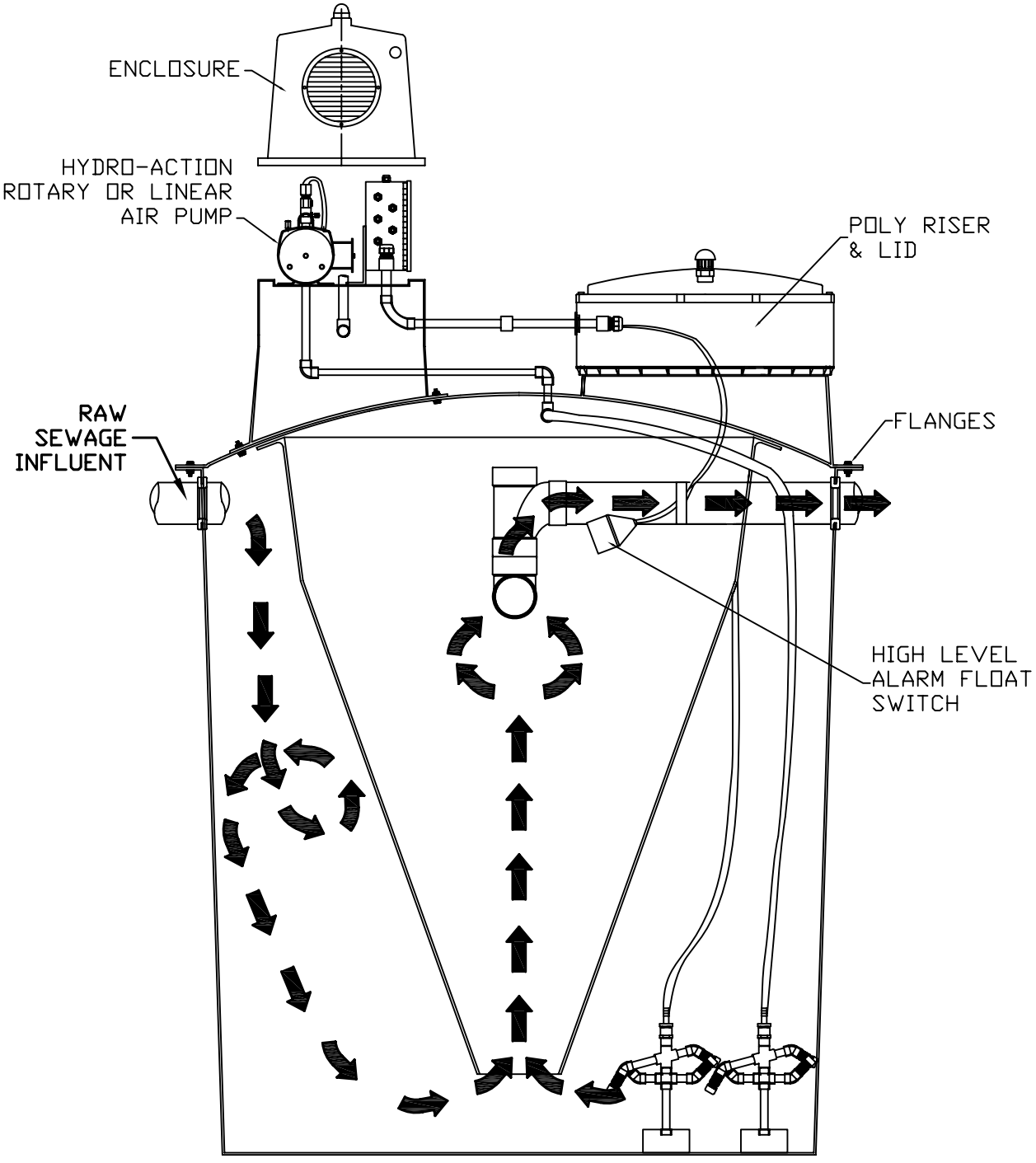
AP SERIES WWTP PROCESS FLOW DIAGRAM



HYDRO-ACTION AP SERIES
CLASS 1 AEROBIC PLANT

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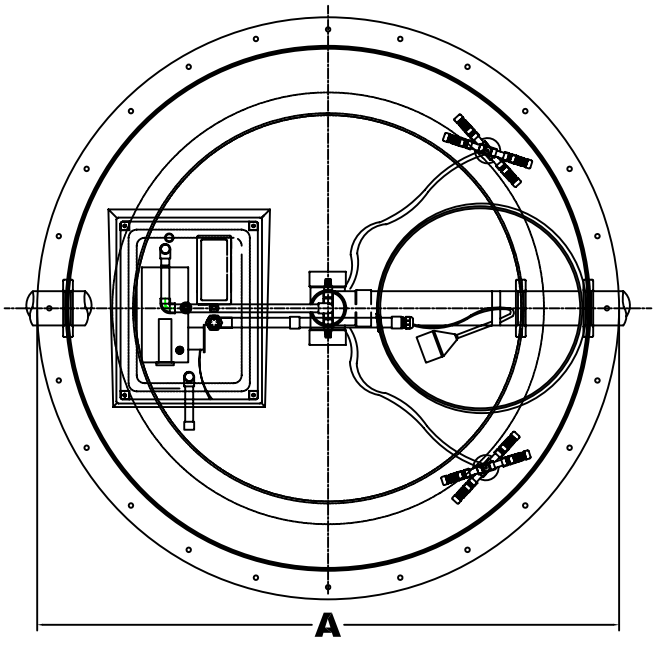
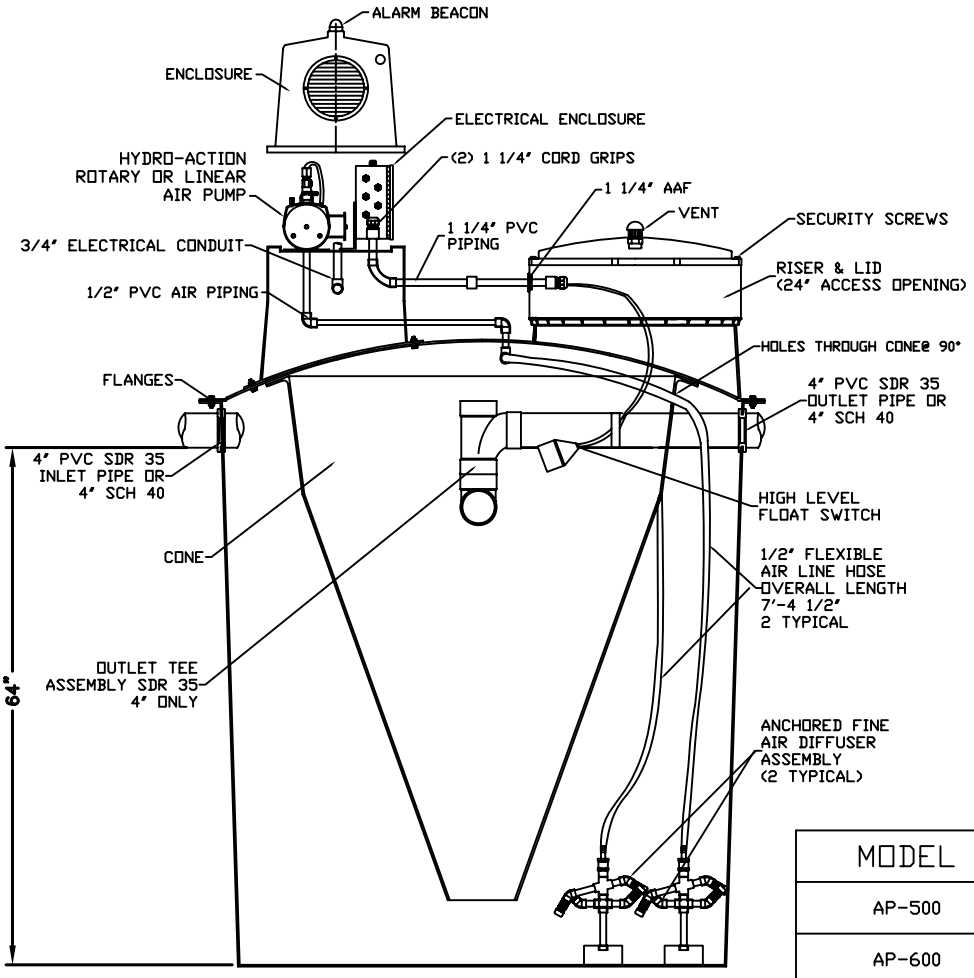
green from the ground up

AP-500, AP-600 & AP-750 WASTEWATER TREATMENT PLANT DETAILS




ALARM BEACON
ENCLOSURE
ELECTRICAL ENCLOSURE
(2) 1 1/4" CORD GRIPS
HYDRO-ACTION ROTARY OR LINEAR AIR PUMP
1 1/4" AAF
VENT
SECURITY SCREWS
3/4" ELECTRICAL CONDUIT
1 1/4" PVC PIPING
RISER & LID (24" ACCESS OPENING)
1/2" PVC AIR PIPING
HOLES THROUGH CONE@ 90°
FLANGES
4" PVC SDR 35 OUTLET PIPE OR 4" SCH 40
4" PVC SDR 35 INLET PIPE OR 4" SCH 40
HIGH LEVEL FLOAT SWITCH
CONE
1/2" FLEXIBLE AIR LINE HOSE OVERALL LENGTH 7'-4 1/2" 2 TYPICAL
OUTLET TEE ASSEMBLY SDR 35 4" ONLY
64"
ANCHORED FINE AIR DIFFUSER ASSEMBLY (2 TYPICAL)

MODEL	A
AP-500	64 3/8"
AP-600	70 3/8"
AP-750	76 1/8"

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green from the ground up

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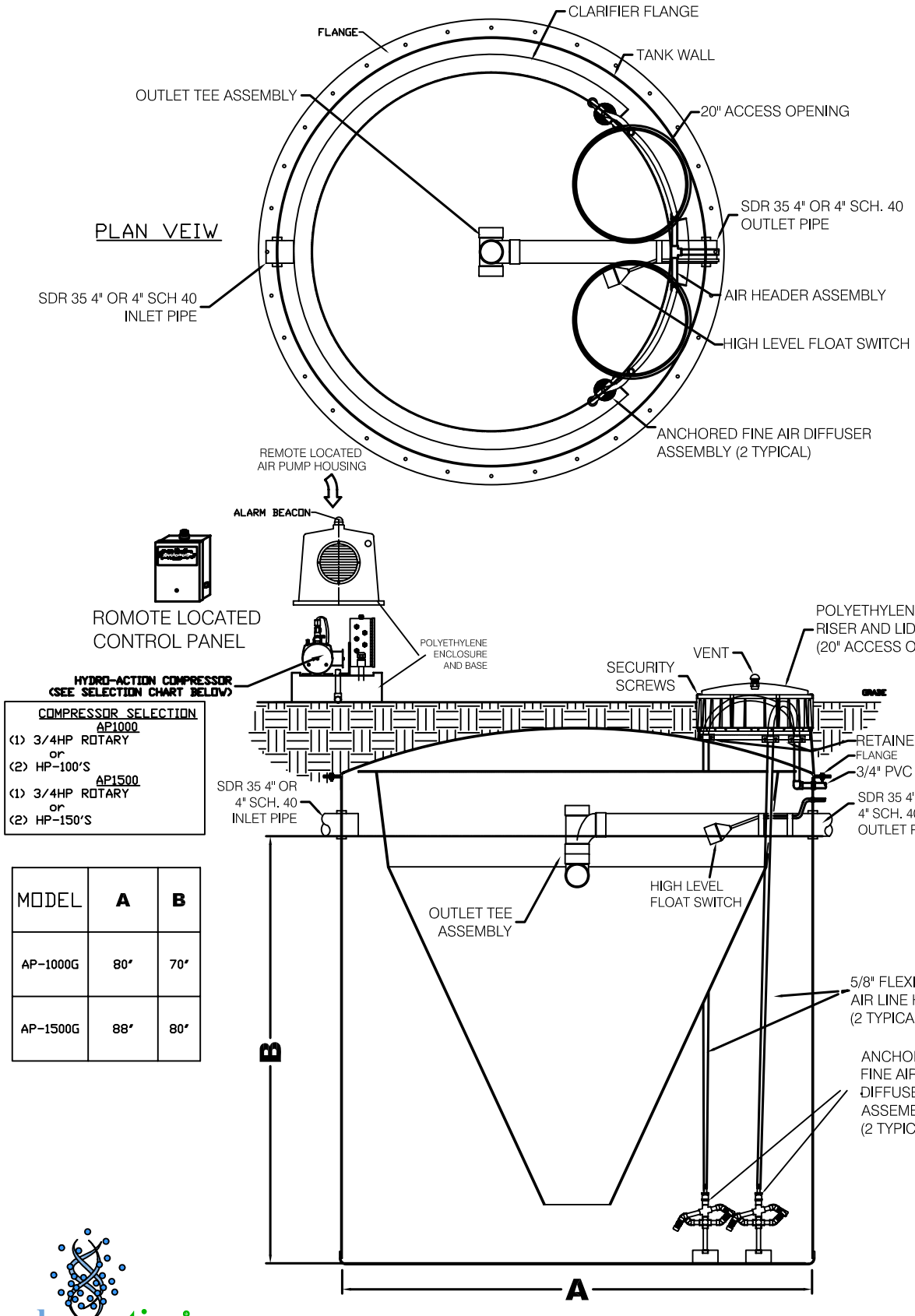
AP-1000G & AP-1500G WASTEWATER TREATMENT PLANT DETAILS



COMPRESSOR SELECTION

AP1000

(1) 3/4HP ROTARY
or
(2) HP-100'S

AP1500

(1) 3/4HP ROTARY
or
(2) HP-150'S

MODEL	A	B
AP-1000G	80'	70'
AP-1500G	88'	80'

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green from the ground up

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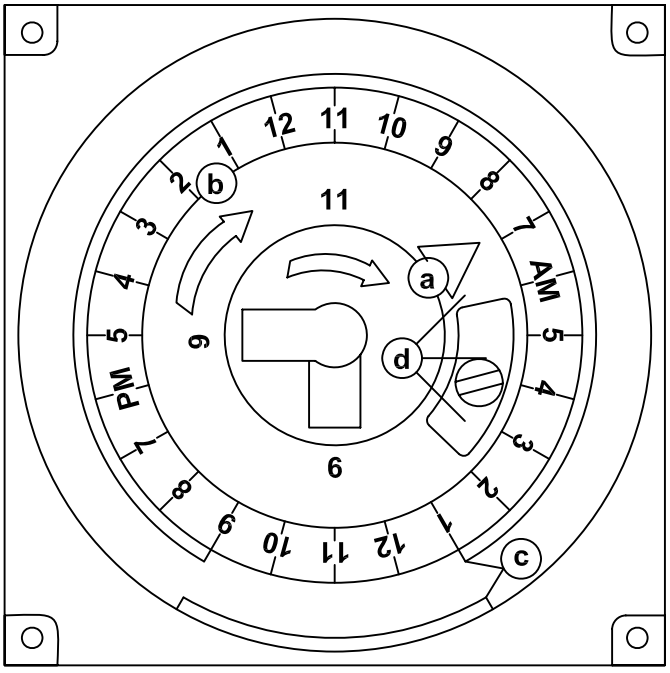
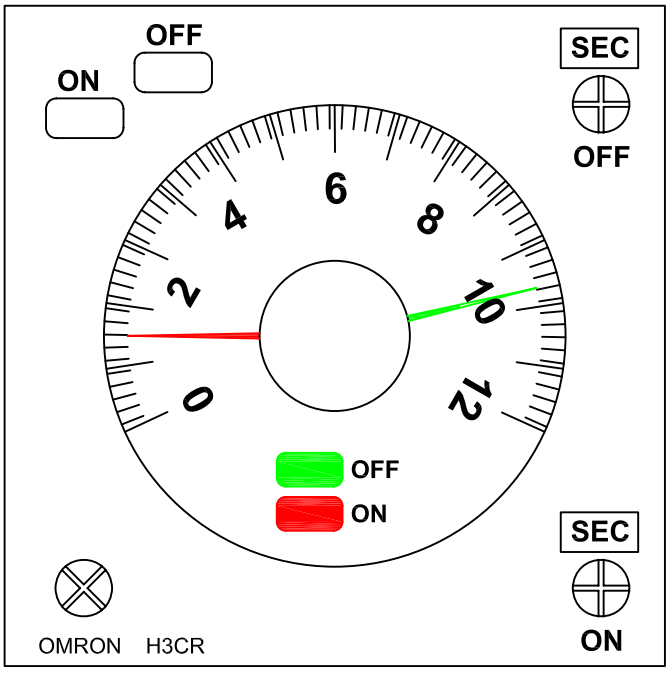
OPS TIMERS

MODEL
50-30



24 HR
GRASSLIN
TIMER

MODEL
50-32



MICRO-DOSE
OMERON
TIMER

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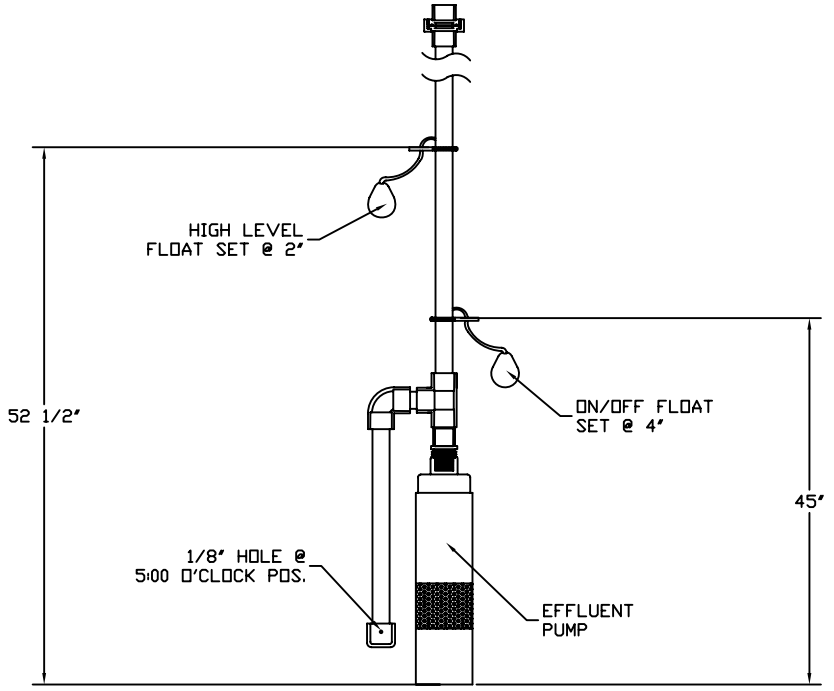
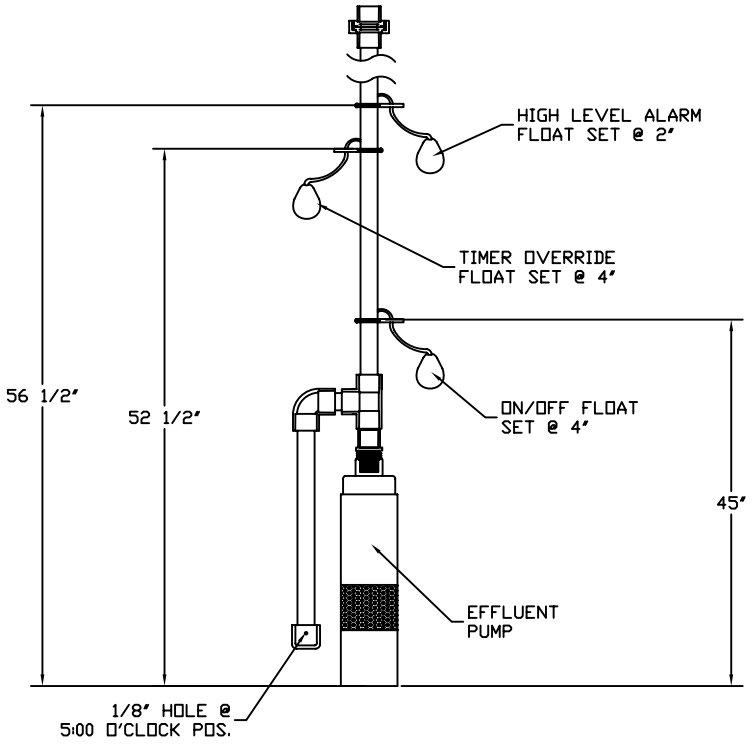
green from the ground up

50-20/ 31-31A-32 OPS



50-30A OPS



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hydroaction
green from the ground up

Appendix 6: Misc. Forms & Documents

Suggested Initial Service Contract.....

Suggested Service Call Procedure.....

Service Technician Checklist.....

Installation Checklist.....

Regulator Checklist.....

Limited Warranty.....

Warranty Registration.....

Proper use of the Sludge Judge.....

Homeowner Care Instructions.....

Compressor Serial Number Locations .....

Data Plate & Serial Number Locations .....

INITIAL SERVICE POLICY

Our company, _____, will provide a two-year initial service policy, which will provide for inspection and service of your **Hydro-Action®** treatment plant. The policy will include the following:

- Four inspection/service calls (at least one every six (6) months) or _____ inspection/service calls every _____ months as per local regulation, over the two (2) year period including inspection, adjustment and servicing of the mechanical, electrical and other applicable component parts to ensure proper function. This includes inspecting OPS®, air pump, air filter, diffuser operation, and cleaning and replacing or repairing any component not found to be functioning correctly. (In the state of Texas, this service must be performed three times per year, timed to every four months.)

- An effluent quality inspection consisting of a visual check for color, turbidity, scum overflow and examination for odors.

- Maintenance company will visit the property in response to a complaint by the property owner regarding the operation of the system within _____ hours.

- Disinfection unit (if applicable) will be maintained by:

  Property Owner Maintenance Company

The following person is certified by Hydro-Action® to perform service on Hydro-Action® systems:

_____

(Certified Hydro-Action® Industries Service Technician – Please Print Name) (HAI Cert. #)

If any improper operation is observed that cannot be corrected at the time of the inspection/service call, you shall be notified immediately in writing of the conditions and the estimated date of correction.

At the conclusion of the initial service policy, our company will make available, for purchase on an annual basis, a continuing service policy to cover labor for normal inspection, maintenance, and repair.

Owner/user operation instructions must be strictly followed or warranties are subject to invalidation.

Pumping of sludge build-up from the plant, if necessary, is not included in these services.

OWNER:	**MAINTENANCE COMPANY:**
_____	_____
_____	_____
_____	_____
DATE: _____	_____

AK/HA Manufacturing, LLC

Suggested Service Call Procedure

Hydro-Action® Industries' aerobic treatment systems should be serviced at least every six months per NSF International regulation. Some states require more frequent calls. This service call procedure meets all NSF International requirements for the Aerobic Treatment Unit as well as pretreatment and pump tanks.

Service Procedure:

1. Remove cover from OPS® Operations Control Center. Open access covers on treatment unit, pre-treatment and pump tanks. Observe the mixed liquor in the mixing chamber of the treatment unit. Note on the inspection report the condition per your Plant Condition Chart. If there is a noticable odor in either the treatment unit or pump tank, take a Settleable Solids Test sample and set aside. This test may be observed after 45 minutes settling time and read per your Plant Condition Chart.

2. Gauge back pressure in the air system by attaching a 5 psi air gauge to the provided schrader valve. Note the reading on your inspection report. Back pressure should be between 2.75 psi and 3.5 psi for normal operation. If the back pressure exceeds 3.5 psi, replace the diffuser stones. If back pressure is allowed to exceed 4 psi for any length of time, air pump damage may occur. In an initial visit to an existing system, inspect the diffuser stones prior to taking air pressure readings; if the stones are clogged, the overpressure you will encounter may damage the 5 psi gauge.

3. Remove small air pressure tube from barbed fitting beside schrader valve. Low Air Pressure Alarm should sound. Re-attach tube to barbed fitting.

4. Inspect air pump filters, cleaning or replacing as necessary.

5. Remove any surface sludge from the mixing chamber and clarification chamber. Dispose of this sludge as local regulations require.

6. Inspect high level alarm function by lifting the float. Alarm should sound. Note results in your inspection report.

7. Take a sludge level reading from the mixing chamber and note in your inspection report. Read settleable solids test and note results on your inspection report. Pour test sample back into mixing chamber. Close the access cover and secure with security screws.

8. Lift high level alarm (upper) float in pump tank to assure proper operation. Alarm should sound.

9. Remove effluent pump stalk. Lift lower float to test. Pump should start when float is lifted above level. Do not run effluent pump over 5 seconds by this method or effluent pump damage may occur.

10. Remove and clean effluent pump screens. If a Chlorine Residual Test is to be performed, take your sample at this time. If the system is chlorinated, check chlorine level and add chlorine if necessary.

11. Replace pump stalk and replace access cover, securing with security screws. Replace cover on OPS® unit and secure with security screws.

12. Take a sludge reading from the pretreatment tank and note in your inspection report. Replace cover and secure with security screws.

13. Complete your inspection report and leave a copy with the homeowner.

14. Mail a copy of your inspection report to the local authority and retain the original in your files.

AK/HA Manufacturing, LLC

Service Technician Checklist

Hydro-action Industries' aerobic treatment systems should be serviced at least every six months per NSF requirements. Please consult the Suggested Service Call Procedure and the Operation & Maintenance Manual while performing this checklist.

- [ ] Remove covers from OPS, Pre-treat, ATU, and Pump Tank.
  notes:
- [ ] Note condition of ATU by consulting Plant Condition Chart
  notes:
- [ ] Perform Settleable Solids Test
  notes:
- [ ] Gauge back pressure
  notes:
- [ ] Perform Air Pressure Alarm Check by removing tube from barbed fitting
  notes:
- [ ] Inspect pump filters
  notes:
- [ ] Remove any surface sludge from ATU
  notes:
- [ ] Inspect high level alarms (ATU & Pump Tank)
  notes:
- [ ] Measure sludge level w/ Sludge Judge (ATU & Pre-treat Tank)
  notes:
- [ ] Check effluent pump on/off float
  notes:
- [ ] Check chlorinator & chlorine level
  notes:
- [ ] Replace covers w/ supplied security screws
  notes:
- [ ] Complete Inspection Report and make copies for; Homeowner, Local Authority, and Self
  notes:

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Installation Checklist

Hydro-action Industries' aerobic treatment systems should be serviced at least every six months per NSF requirements. Please consult the Installation Manual while performing this checklist.

- ☐ Chose site and soil condition, excavate
  notes:
- ☐ Install gradeable material and level system
  notes:
- ☐ Fill tanks with water and leak check while buring
  notes:
- ☐ Connect inlet and discharge piping
  notes:
- ☐ Install OPS as per instructions and run power conduit
  notes:
- ☐ Install diffuser assemblies
  notes:
- ☐ Install OPS and Tank Covers w/ supplied security screws
  notes:
- ☐ Follow start-up procedure and educate homeowner on their system
  notes:
- ☐ Perform system check to insure proper operation
  notes:
- ☐ Fill out installation / warranty sheet
  notes:
- ☐ Give copy of homeowners manual to homeowner
  notes:
- ☐ Give homeowner copy of service contract and warranty sheet
  notes:
- ☐ Send in installation warranty sheet to Manufacturer
  notes:

AK/HA Manufacturing, LLC

Regulator Installation Checklist

Hydro-Action® Industries' aerobic treatment systems should be serviced at least every six months per NSF requirements. Please consult the Installation Manual while performing this checklist.

- ☐ Insure that installer has chosen site with proper soil conditions and proper excavation technique.
  notes:
- ☐ Insure that installer has used gradeable material, compacted and leveled system properly.
  notes:
- ☐ Insure that installer has filled tanks with water, and performed a leak check.
  notes:
- ☐ Insure that the inlet and discharge piping is properly connected and secured.
  notes:
- ☐ Insure that OPS was properly installed and power ran to house within regulation.
  notes:
- ☐ Insure that diffuser assemblies are installed per instructions.
  notes:
- ☐ Insure that the OPS and Tank Covers are installed with atleast two security screws per cover.
  notes:
- ☐ Insure proper start-up procedure and homeowner has been educated on their system.
  notes:
- ☐ Have installer perform system check to insure proper operation.
  notes:
- ☐ Insure that the installer has filled out installation / warranty sheet .
  notes:
- ☐ Insure that installer has given copy of homeowners manual to homeowner.
  notes:
- ☐ Insure installer has given homeowner copy of service contract and warranty sheet.
  notes:

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Limited Warranty

AK/HA Manufacturing, LLC d/b/a **Hydro-*Action* Industries ("Hydro-*Action* Industries")** warrants each Hydro-*Action* Industries aerobic wastewater treatment plant ("plant") to be free from defects in materials and workmanship for a limited, prorated five (5) year period from the date of installation by an authorized **Hydro-*Action* Industries** dealer for the end user when properly registered with **Hydro-*Action* Industries** by the submission of the warranty sheet found in this manual.

The first two (2) years LIMITED WARRANTY is 100% on all components. Then followed by an additional three (3) year Limited Warranty, the Third (3rd) year at 75%, the Fourth (4th) year at 50% and the Fifth (5th) year at 25%. The Third, Fourth and Fifth years limited, prorated warranty apply only if the plant is maintained by an authorized distributor through a continuous maintenance program and proof is provide with the return. All components manufactured by AK Industries, Inc are warranted for Five (5) years.

The sole remedy under the LIMITED WARRANY is as follows: **Hydro-*Action* Industries** may, at its sole option, replace or exchange any component part, F.O.B. factory, that in **Hydro-*Action* Industries** reasonable judgment shows evidence of defects in material and/or workmanship, provided said component part has been paid for and returned through an authorized **Hydro-*Action* Industries** dealer, transportation prepaid, to **Hydro-*Action* Industries** at 2055 Pidco Drive, Plymouth, IN, 46563. The end user must at the time also specify the nature of the defect, in writing, to **Hydro-*Action* Industries** at the same address. No claim may be made unless the end user specifies the nature of the defect. This LIMITED WARRANTY applies to parts only. Any and all labor charges shall be the responsibility of the user. The LIMITED WARRANTY does not apply to consumables, such as but not limited to stones, filters, etc.

The LIMITED WARRANTY does not cover **Hydro-*Action* Industries** aerobic wastewater treatment plants and related components that have been flooded, by external means, or that have been disassembled by unauthorized persons, improperly installed, subject to external damage or damage due to altered of improper wiring or overload protection.

No warranty is made as to the field performance of any systems. The LIMITED WARRANTY applies only to the parts manufactured by **Hydro-*Action* Industries** and does not include any portion of the plumbing, drainage, house wiring or installation of the plants. In no event shall **Hydro-*Action* Industries** be responsible for delays or damages of any kind or character resulting from, or caused directly or indirectly by, defective components or materials manufactured by others.

The LIMITED WARRANTY extends solely to the end user of this product. The end user is defined as the purchaser who first has the plant installed, or in the case of a plant designed for non-permanent installation, the purchaser who first uses the plant. It is the end users obligation to make known to any other customer the terms and conditions of this LIMITED WARRANTY.

Hydro-*Action* Industries reserves the right to revise, change, or modify the construction and design of the **Hydro-*Action* Industries** aerobic wastewater treatment plant, or any component part or parts thereof, without incurring any obligations to make such changes or modifications in previously sold equipment. **Hydro-*Action* Industries** also reserves the right, in making replacement of component parts under this LIMITED WARRANTY, to furnish a component part, which, in its judgment, is equivalent to the part replaced.

Effective 7/1/09

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Warranty Registration

Hydro-*Action*® Industries
2055 Pidco Drive
Plymouth, IN. 46563
800.370.3749

This form must be filed with* Hydro-*Action*® *Industries by the dealer within 30 calendar days after installation or all warranties are void.

Owner/User _____
Address _____
City/County/State/Zip _____
Phone _____
Best time to be reached _____

Dealer/Installer _____
Address _____
City/State/Zip _____
Phone _____
Distributor (if applicable) _____

Service will be performed by: _____
Name _____
City/State/Zip _____
Phone _____

Type of Installation: Residential _____ Commercial _____
Number of residents or occupants _____ Garbage disposal? Yes _____ No _____
Date Installed _____
Plant Model # _____ OPS® Model # _____
Plant Serial # _____ Air Pump Serial # _____
Effluent disposal method & equipment used _____

Controlling Regulatory Agency: _____
Agency _____
Sanitarian _____
Address _____
City/State/Zip _____
Phone _____

Proper use of the Sludge Judge in Hydro-Action Industries Systems

A Sludge Judge is a device used to discover tankage sludge levels. Proper use in our systems is as follows:

1. Let the Sludge Judge down into the tank to be tested, being sure to keep the Sludge Judge as close to vertical as possible, until it contacts the bottom of the tank. (As sludge in the ATU tends to assume a dished shape due to mixing currents, two readings should be tanken: against the tank wall and the center of the clarifier.)

2. Pull the Sludge Judge vertically out of the tank and inspect.

3. You should find a sludge level indicated in the barrel of the Sludge Judge. Note that the barrel of the Sludge Judge is marked in 1 foot intervals. Using these marks, estimate the depth of sludge indicated to the nearest inch (i.e. halfway between marks would be 6", etc.)

4. Make a note of the sludge levels on your inspection report.

System Tankage Sludge Level Suggestions

Tankage	Level	Logic
Pretreatment Tank	18" to 24"	The primary problem with sludge build-up in the pre-treatment (or 'trash') tank is one of obstructed volume. An important role played by this tank is the dilution of chemicals harmful to the bacterial colony. As sludge builds up in this tank, the volume of liquid influent is reduced, thereby reducing the total volume available for dilution.
Aerobic Treatment Unit	6"	The clarifying cone in the center of the ATU extends to within 8" of the bottom of the tank. If the opening at the bottom of this cone is obstructed, cleaned mixed liquor cannot enter the clarifier, leading to poor quality effluent.
Pump Tank	10"	Sludge build-up is almost never a problem in the pump tank, due to the extremely pure effluent produced in the ATU. We use a mid-suction pump in the pump tank, and the intake on that pump is 12" from the bottom of the tank. If sludge is allowed to enter this intake, effluent pump life will at least be greatly shortened, and the pump could possibly fail immediately. Such a failure is not warrantied.

Homeowner Care of a Residential Aerobic Wastewater Treatment System

All Aerobic Wastewater Treatment Systems are suspended growth floating bio-mass systems designed to treat common household sewage only.

In plain language, this means that the systems contain and depend on an aerobic (oxygen-requiring) bacterial colony which, when well cared for, digests and treats household sewage just as aerobic bacteria clean groundwater in nature. This is why aerobic systems have an air pump and air distribution piping – for supplying the aerobic bacteria with oxygen. Bacteria, however, can't eat just anything and everything. For a listing of things to avoid feeding to an aerobic bacterial system, see below.

Normal maintenance is required on all aerobic treatment units, as they are activated sludge sewage treatment systems just like large municipal water treatment plants. Our factory-trained Hydro-*Action* Industries installers or service technicians regularly service our installations, checking to be sure that these systems are in proper working order.

Aerobic systems are not designed for disposal of solid waste or chemicals. If homeowners stay within the guidlines listed below, their systems should function properly as sewage treatment systems and should not require unscheduled maintenance or frequent expensive pump-outs.

What NOT to put in an aerobic treatment system:

- Non-biodegradable items such as cigarette butts, match sticks, disposable diapers, feminine hygene products, condoms, hair, coffee grounds, rags, paper towels, bandages, etc. These are solid-waste items and should be disposed of in regular trash service.
- Greases, fats or oils. This includes cooking oils and meat or meat grease.
- Pesticides, herbicides, photographic chemicals or other toxins.
- Paints, thinners or household chemicals, including many cleaning compounds, and mop-bucket water.
- Water softener unit backwash.
- Citrus products, oranges, lemons, grapefruit, etc.
- Home-brewery or winemaking wastes.
- Strong medicines, particularly antibiotics.
- Antibacterial soaps and antibacterial laundry detergents should be avoided. These are the current marketing rage, but overuse will only breed resistant strains of bacteria in the home, and kill the aerobic action in the treatment system.
- Strong disinfectants or bleaches, particularly products containing chlorine or ammonia.
- Commercial septic tank additives; they do more harm than good.
- Kitchen garbage grinders (disposals) should be used sparingly, if at all. Dispose of food waste in a solid waste bin or compost heap. Food waste represents additional loading on the aerobic plant, possibly causing organic overloading and more frequent pump-outs of the system.

Volumetric Overload of an Aerobic System

Our system is rated for a maximum volume throughput per day, ie. 500 gallons per day (GPD) for an AP-500, 600 GPD for an AP-600, etc., and only household wastewater (sinks, tubs, washing machines, toilets, etc.) should be allowed into the unit. 'Volumetric overloading' is simply a term used to describe putting more than the rated amount of wastewater through the system during a 24 hour period.

To avoid volumetric overloading of our system, which can result in incomplete treatment conditions, observe the following:

- Avoid multiple wash loads in one day; spread out your laundry during the week.
- Watch for leaking/flowing faucets or toilets and repair immediately.
- Use water flow reducing devices whenever possible.
- Be aware of any excessive water use of any kind.

Home Cleaning Products Guidelines:

- Recommended laundry detergents are: Powdered, low-sudsing, low-phosphate, non-antibacterial and bio-degradable.
- Recommended household cleaning products are: Non-chlorine, non-ammonia, non-antibacterial, non-toxic and bio-degradable.

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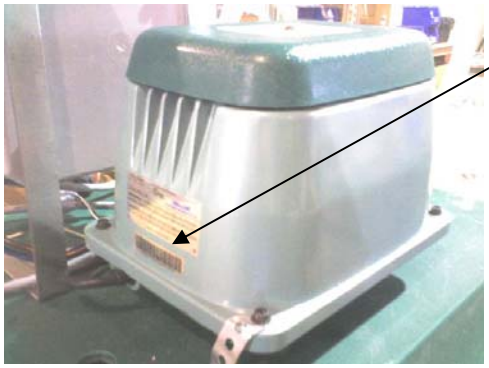
Compressor Serial Number Locations



(Barcode)

100884883

(Serial Number)

(The first 4 numbers indicate year and month for date coding)

Data Plate Serial Number Locations

Data Plate for AP Unit

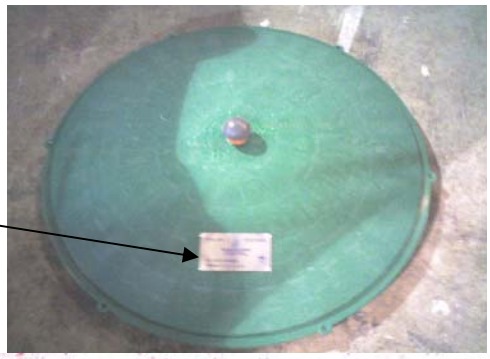
MODEL AP-500
CLASS 1 WWTP

CAPACITY 500GPD

hydro-action
green from the ground up
PLYMOUTH, INDIANA

U.S. PATENT # PENDING

SERIAL#



Data Plate for OPS

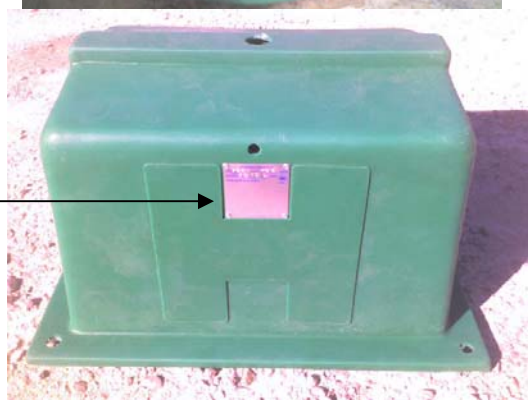
NORMAL/SILENCE

AP Class 1 WWTP CAP: GPD

MODEL____ - ____ - ____ OPS

FOR SERVICE CALL:_____

PLACE SERVICE PROVIDER LABEL HERE



Appendix 7: NSF Certification & Responsibilities

Hydro-Action® Industries' on-site wastewater treatment plants have been tested and certified to ANSI/NSF Standard 40 requirements. This means that; when properly installed, used, and maintained the plants produce effluent that meets the criteria for EPA secondary treatment (clear, odorless water).

Dealers and Distributors benefit from selling an NSF certified product; since homeowners and regulators are assured that the product meets the highest standards available. Maintaining our certification however, is a responsibility that all involved must take seriously.

As per the condition of certification, NSF mandates audits as a check & balance of approved systems. Each year NSF is authorized to audit 4 Dealer or Distributors of each manufacturer. By doing these audits it assures that the manufacturers are complying with all components of their approved standard. In the same respect manufacturers are mandated to perform audits on 10% of all their dealers. This insures that Dealers and Distributors are complying with their portions of the standard.

An NSF audit comes unannounced, and Dealers should be prepared at all times. NSF will perform certain inspections to help assess certification compliance. There are three portions of Inspection; The Site Visit Inspection Report, Authorized Representative Inspection Report, and Authorized Representative Verification Report.

NSF Standard 40 Site Visit Inspection Report

The Site Visit Inspection Report is an inspection to be completed on each system that NSF wishes to inspect. Three systems are picked at random and visited to perform the inspection. Items that are looked at are as follows…

1. **Is the record of installation and maintenance on this installation up to date and adequate?** This question is usually best answered by having the appropriate installation sheet and any pertinent local permit information available.
2. **Service available within two working days?** It is NSF's policy to be able to service a call within 48 hours. Simple records showing dates of any services performed and dates will suffice. If no maintenance was necessary on the system, then a Dealer can simply state their 48 hour policy to the inspector.
3. **Are all component parts properly installed and operating?** The auditor will simply inspect the system for compliance and document deficiencies.
4. **Are all data plates properly attached to: a. the control panel and b. the tank, riser, or aeration equipment?** The manufacturer should have these data plates installed at time of shipment, however, if one becomes damaged or missing contact **Hydro-Action®** immediately. A replacement will be provided.
5. **Have any modifications been made to the plant?** NSF does not allow any modifications to be made to the certified plant. Altering the system could put the Dealer and Manufacturer in jeopardy. No modifications are allowed or condoned by **Hydro-Action®**.
6. **Are all access covers secure? And by what method? Hydro-Action®** utilizes tri-groove tamperproof screws to eliminate unauthorized entry to its systems. The safety screws also prevent accidental entry by children. **Hydro-Action®,** policy on this is firm. Each lid should have at minimum two (2) security screws.
7. **Does the effluent appear turbid or foamy?** This will give an auditor an indication of how well the system has been maintained.
8. **Was user's manual available at the site?** It is a good idea to have the homeowner available to provide this. Otherwise, it is a good idea to keep proof that the homeowner has received a copy.
9. **Was the local regulatory official present during this inspection?** Although no required, it is convenient to have the local official there to answer questions, and get a good feel for their confidence of **Hydro-Action®** systems.

NSF Standard 40 Authorized Representative Inspection Report

The Authorized Representative Report is an inspection to check for proper documentation required to comply with NSF

certification. The questions asked are as follows…

1. **Was the authorized representative trained by the Certified Company concerning proper fabrication, installation, service, maintenance, and recordkeeping?** This is answered simply by being able to provide a training certificate and certification card. **Hydro-Action®** issues these documents once proper training outlined has been completed. Request these documents if yours are missing, or not issued.
2. **Does authorized representative have complete set of operation, maintenance and installation instructions on file for each model?** These manuals can be found at www.hydro-action.com or requested from **Hydro-Action®**.
3. **Was a copy of Standard 40 available?** This can be provided by Hydro-Action® if not available.
4. **Was a copy of the "General Policies Relating to the Use of an NSF Certification Mark" and "The Program Specific Policies for Wastewater Treatment Devices" on file?** This can be provided by **Hydro-Action®** if not available.
5. **Did the authorized representative have a copy of the Certified Company's Official Listing?** This can be provided by **Hydro-Action®** or downloaded from the NSF website if not available.
6. **Was a copy of the Wastewater Technology Report for the plant(s) on file?** This can be provided by **Hydro-Action®** if not available.
7. **Are the dimensions of the plant(s) identical to those published in the Wastewater Technology Report?** The inspection of the tanks will be made to insure that no one has altered or modified the system.
8. **Are the plants fiberglass or concrete? (circle one)** Merely an observation to determine which model.
9. **Are the components identical to those Listed (i.e., pumps, warning buzzers, aerators.)?** Again, no alterations are to be made to the system.
10. **Has the authorized representative made any modifications to the design and/or construction of the Listed plant(s)?** NSF does not allow any modifications to be made to the certified plant. Altering the system could put the Dealer and Manufacturer in jeopardy. No modifications are allowed or condoned by **Hydro-Action®**.
11. **Does the plant exhibit a smooth interior finish?** Observation made to determine plant condition.
12. **Does the plant bear the NSF Mark?** Refer to "Guide for Using the NSF Mark". No unauthorized usage on the system nor literature are condoned by **Hydro-Action®**.
13. **Data Plates?** The following is inspected on the certified system…
    a. **Is a data plate attached to the control box?** A data plate must attached to the control panel or doghouse as per certification.
    b. **Is the second data plate attached to the aerator, tank, or riser?** A data plate must also be attached in the vicinity of the aerator, tank, or riser. **Hydro-Action®** has placed its data plate on the lid of the access to comply with this requirement.
    c. **Are the data plates permanently attached and easy to read?** Visual Inspection.
    d. **Is the following information included; Listed name of manufacturer, Model number, Serial number, Rated capacity, and Class designation?** Visual Inspection.
14. **Is a complete set of instructions for installation, initiation of service, operation, and maintenance provided to the user?** Provided documents should be requested from the home-owner, and explain that they are also available via www.hydro-action.com.
15. **Is a continuous service policy available to each owner? (attach copy)** Copies of all service of the systems should be made available.
16. **Is the authorized representative's service label, including name, address, and phone number, attached to the control box?** This should be attached to the data plate on the control.
17. **Are six month service calls being conducted and recorded?** Proofed by showing the inspection reports.
18. **Are records of installations and service properly recorded? a. Are details of the service provided recorded? b. Are emergency calls recorded?** Records should be kept and filed on each system installed.

Producing these will help pass this section of the inspection.

19. **Are component parts (i.e., aerators, filters, etc.) available should a plant's components need repair?** Parts can be maintained at Dealer location and are also available with same day shipping to allow rapid service.
20. **Does the authorized representative distribute any literature concerning the plant(s) other than the Listed Company's literature? (If so, attach a copy.)** This inspection is performed to insure proper use of the NSF mark.
21. **Does the authorized representative advertise locally, or in the phone book Listed plants or reference NSF? (If yes, attach copy of ads)** Again, to insure proper use of the NSF mark.
22. **Are the three site visit inspection forms attached?** These are the prior explained inspections, minimum of three are performed.

NSF Standard 40 Authorized Representative Verification Report

The Authorized Representative Verification Report is similar to the Authorized Representative Inspection report. Its contents are repetitive, but utilized for companies where the Distributor does not act as the Dealer. Refer to the Authorized Representative Inspection Report above for reference.

AK/HA Manufacturing LLC.

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